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NEWSPAPER

IBM Opening Up on Software Data?

By Don Leavitt
CW Staff

ROSSLYN, Va. — There are indications that software from IBM and from the independent vendors will fit together better in the not-too-distant future.

Once quite bitter competitors for the user's software dollar, IBM and the Association of Data Processing Service Organizations Adapso) are moving towards positions that ire still competitive, but tinged with cooperation when it seems in the best interest of all concerned.

Under pressure from Adapso, for example, BM has been gradually easing the restrictions it has had on distribution of information about a number of its software products. The relaxation includes the offering of free trials, the provision of documentation well ahead of product delivery and — through the Software Information Exchange program [CW, July 16] — release of technical data when products first go out to early support sites, rather than at first general delivery.

Continuing Dialogue

For its part, Adapso's board of directors acknowledged the "continuing dialogue" it now has with IBM by passing a resolution lauding IBM's efforts to date to resolve "major issues" raised by Adapso members. Passage of that resolution was a landmark: the board had never commended IBM previously, according to Adapso President John P. Imlay.

In an October letter to Imlay — released by him after Adapso's recent meeting in Colorado — IBM's director of industrial relations, Edward J. Kane, confirmed that IBM program products could be ordered and made available to customers without charge, if returned within a previously defined period.

The testing period varies from product to product, but is usually 30 or 60 days, Kane said, adding that within this time period potential customers should be able to decide

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Commtex Offers Net Monitor Used by NBS

By Brad Schultz
CW Staff

CROFTON, Md. — The third-generation system used by the National Bureau of Standards (NBS) to monitor data network performance is now available to the general user community.

Crofton-based Commtex, Inc. developed the system for NBS and is selling it as the CTX-100. NBS calls it the Network Measurement Instrument. The design is reportedly based on a multiple microprocessor system architecture to achieve portability, minimize costs and adhere to the model for earlier NBS network monitors.

A CW Special Report on data networks precedes Page 51.

According to Commtex President Donald W. Parker, the CTX-100 "fills some very large holes in three broad areas." They are network design and maintenance of design; equipment selection, including procurement benchmarking; and network management, which Parker defined as "cost/performance maintenance."

Tactical Concerns

The latest monitor systems focus on "tactical," rather than "strategic," concerns of network performance, Parker explained. Such systems include Paradyne Corp.'s Analysis and Avant-Garde, Inc.'s Net/Alert [see articles on SR/32 and SR/42 in this issue's Special Report] as well as Atlantic Research Corp.'s Intershake and Spectron Corp.'s Datascope [CW, May 28].

In the model of network management and control Parker has used in teaching, tactical elements comprise the "technical control subsystem and op-

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Repeated DP Outages Cited

FAA Blasted for Menacing Safety

By Marguerite Zientara
CW Staff

WASHINGTON, D.C. — Repeated outages of air traffic control computers in the 20 Air Route Traffic Control Centers (ARTCC) around the U.S. pose "a serious menace to the safety of air passengers and crews," John Leyden, president of the Professional Air Traffic Controllers Organization (Patco), charged at a press conference here last Tuesday.

Leyden blasted the Federal Aviation Administration (FAA) for "a lack of proper long-range planning and, more importantly, a refusal to reassess its priorities and immediately request the necessary funds for procurement of needed computer equipment."

Air traffic controllers have long complained of the hardship and "potentially extremely dangerous" situations posed by breakdowns of air traffic control computers in both airport control towers and ARTCCs and have repeatedly called for the installation of backup computer systems.

The present IBM 360-based 9020D and 9020E air traffic control systems are "obsolete," Leyden told the press conference. Three weeks earlier, a computer failed at the Leesburg, Va., ARTCC, and moments later two passenger jets nearly collided over North Carolina [CW, Nov. 12].

The 9020D and 9020E "have exceeded their normal anticipated life span," Leyden charged. "In fact, manufacturers no longer make the replacement parts for some of the most critical components of these computers.

"Air traffic controllers are increasingly concerned about accepting responsibility for air traffic separation using equipment that may be over-

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Canada Designing Antenna That Could Slice Net Costs

By Phil Hirsch
CW Washington Bureau

OTTAWA — A 3-meter (10-foot) two-way earth station which could drastically reduce users' satellite communications costs someday is under development within the Canadian government's Department of Communications (DOC).

The smaller antenna may be ready for a field trial in a year and a half, a DOC spokesman said.

In contrast, the smallest two-way earth station likely to be offered commercially during the next few years has a diameter of five meters (16.5 feet) and costs more than $200,000.

DOC's goal, according to the spokesman, is an antenna priced at $12,000 to $15,000 "in production quantities of a few hundred." He quickly emphasized, however, that the Canadian antenna would have extremely limited capabilities, suitable only for users whose voice and data communications requirements are small.

Furthermore, the $15,000 target price is what a communications carrier or service supplier might pay. His markup, together with maintenance support and marketing charges, would probably push the retail price to about $30,000.

The DOC antenna has a power output of only 1.5 watts, which reportedly limits it to a single two-way voice channel, plus data transmission at speeds up to 9,600 bit/sec. If used solely for data, it is said to be capable of handling transmission speeds up to 40K bit/sec.

The radio frequency circuitry uses

(Continued on Page 6)

'Panaudit' From Pansophic Keeps DPers Out of Auditing Process

By Tom Henkel
CW Staff

OAK BROOK, Ill. — The best way to keep the DPer's hands out of the cookie jar is to take away the cookies.

That's the theory behind Pansophic Systems, Inc.'s DP auditing package, Panaudit, released here last week.

Claiming the next major computer crime will be committed by a DPer who will cover his tracks by manipulating processing requests made by the DP auditor, Pansophic said its package will eliminate the DPer from the DP auditing picture.

Panaudit is an "auditor-friendly" package for IBM shops, according to its developer, PJ Corum, himself a DP auditor. Although the package is aimed specifically at DP auditors, it can be used by financial auditors as well, Corum noted.

Panaudit is a specialized version of Pansophic's Easytrieve and uses Easytrieve's English-like command structure. That makes it possible for auditors inexperienced in programming to use Panaudit after a three-day training session, Pansophic said.

Once trained, they can develop and run their own programs without going through the DP department, eliminating a possible weak link in data secu-

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Editor E. Drake Lundell Jr.

Managing Editor Nancy French

Senior Editors:
Software Donald Leavitt
Industry Marcia Blumenthal
Systems Howard A. Karten
Communications Brad Schultz
Features John C. Whitmarsh

Senior Writer:
Communications Phil Hirsch

Correspondents:
West Coast Jaffry Beeler
Washington, D.C. Jake Kirchner

Writer/Analyst Marcy Rosenberg
Staff Writers Tom Henkel
Timothy J. Scannall
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Jay Woodruff
Marguerite Zientara

Chief Copy Editor Cheryl M. Gelb
Copy Editors Catherine Marenghi
Steve Milmore
Elissa Mintz
Barbara T. VanScoyoc

Photography Editor Ann Dooley

Editorial Assistants Denise Petski
Martha Taylor

Editorial Cartoonist Jim Orton

Contributors:
Education J. Daniel Couger
Taylor Reports Alan Taylor
Human Connection Jack Stone

For Sales, Circulation and Production contacts, see inside back page.

Please address all correspondence to the appropriate department at 797 Washington Street, Newton, Mass. 02160. Phone: (617) 965-5800. Telex: USA-92-2529

OTHER EDITORIAL OFFICES:

West Coast: 407 California Avenue, Suite 10, Palo Alto, California 94306 Phone: (415) 328-8064

Washington, D.C.: 821 National Press Building, 529 14th Street N.W., Washington, D.C. 20045 Phone: (202) 347-6718

England: Steve Burton, IDG Publishing Ltd., 140-146 Camden Street, London NW1 9PF Phone: 01-267 1201. Telex: 851 264737

W. Germany: Eckhard Utpadel, CW Publikationens, Friedrichstrasse 31, 8000 Munich 40. Phone: (089) 34-90-61. Telex: 5214350.

Asia: Hidetsuna Sasaki, Dempa/Computerworld Company, Dempa Building, 1-11-14, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone (03) 445-6101 Telex: J2424461.

Australia: John P. Costello, Computerworld Pty Ltd., 3 Bruce Street, Crows Nest, NSW 2065 Phone: 929-5388, Telex: SECCO AA25468

Brazil: Eric Hippeau, Data News, Computerworld do Brazil, Servicos a Publicacoes Ltda., Rua Alcindo Guanabara, 25/10th floor 20031 Rio de Janeiro, RJ Brazil. Phone (021) 242-7395 or 263-8046 Telex. 11-32017(WORD BR).

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Amdahl, Memorex Call Off Merger

By Marcia Blumenthal
CW Staff

SANTA CLARA, Calif. — Without offering any explanation, Amdahl Corp. and Memorex Corp. have called off the merger discussions that began last August, when Amdahl proposed issuing 1.2 shares of its common stock for each share of Memorex common.

"My guess is that Memorex put the ball in Amdahl's court and Amdahl was unwilling to sweeten the offer," Robert Harrington, vice-president at Dean Witter Reynolds, Inc., a Palo Alto, Calif., stockbrokerage firm said.

Storage Technology Corp. (STC) recently gave Amdahl a run for its money when it offered to exchange up to 1.75 shares of its common stock for each share of Memorex [CW, Oct. 22]. That offer was rebuffed by Memorex Chairman Robert C. Wilson after the company's board of directors meeting late last month.

Moreover, Wall Street analysts have speculated that Amdahl's offer was exceedingly low.

Since that offer, both companies' stock prices have been linked, Harrington continued, adding that now the shares can trade on their own merits. If Amdahl's prospects brighten and the price of the stock escalates above the current $20 range, then a future offer may be attractive to Memorex, he reasoned.

Although both firms had few comments on the dissipation of the merger talks, Memorex did note that analysts said it should have received a better exchange rate than the one offered by Amdahl. Memorex further stated that it has had no other offers since the one from STC and "is not in a mode of priming ourselves for offers."

However, Harrington has stated that Memorex is definitely for sale. The price of an offer is particularly sensitive for Memorex because it has had a "diplomacy problem with shareholders," who purchased about 750,000 shares of common stock a little more than a year ago for $50.75 per share. Memorex is currently trading at $19.88 per share.

Both companies said they would continue joint selling arrangements in specific transactions. Although this is not a frequent occurrence, Amdahl and Memorex from time to time jointly approach a large user who wants to purchase a complete system.

IBM, Adapso Cooperating

(Continued from Page 1)

whether a particular program product meets their expectations.

If a software vendor wishes to examine an IBM program product to determine, for example, how to interface to it, the trial period option would also apply, Kane noted.

Moreover, after general availability of a product, licensed program material in printed form may be made available, at a customer's request, up to six months prior to shipment of the program product to the customer, he added.

The charge for the documentation — which in some cases might include source code — is one month's program license fee, "which is credited against the first month's billing if the customer or vendor elects to accept the program," the IBM spokesman reported. If the customer doesn't take the program, the fee is forfeited.

Although the documentation is not as directly "testable" as the product itself, access to "whatever documentation is available" gives the customer the chance to review the program over a relatively long period of time for a nominal charge, Kane said.

In an earlier letter — also just released by Imlay — Kane outlined IBM's current attitude on release of information about new products — both program products and system control programs (SCP). He noted that the general policy has been to withhold detailed information until first customer shipment.

He explained that documentation for some products in both cases is available publicly "on a limited basis to allow us to evaluate installation and operational procedures in a customer environment." For those programs, he added, documentation can be made available at the beginning of the limited availability period.

Kane warned Imlay, however, that the information and the documentation distributed so far ahead of general release are subject to change. In any case, IBM will make this early documentation available to "software producers who request it for specific programs" and apparently not on a broadcast basis.

Step Forward

Access to that documentation, even if it does change somewhat, is a major step forward, Imlay commented, since it gives the independent vendors "six months more than we had before" to get to understand IBM's products.

In the letter, written in April, Kane told Imlay that program logic manuals and microfiche would be included in this early support documentation and that IBM would charge a "distribution fee" for the material on SCPs and a license fee (including one month's charges) for program products.

He emphasized that there "is no guarantee that all major announcements will be under early support in the future," but said the material on DOS/VSE, Advanced Function Release 1, Vaam, Power, Ditto "and several others" was available already.

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PRESIDENT

Guess who was just re-elected "Chief Executive of Sorting" with 62% of the vote.

(The Hon. SyncSort OS!)

Call (201) 568-9700.

Ask for a copy of IDC's sort survey.

Who'll win the biggest prize in American politics next year? Will it be Jimmy, Ted, Gerry, Jerry, Bob or Big Jawn? Or some Dark Horse crouched hopefully in the wings?

Frankly, we haven't the foggiest notion about *that*. But — fearless as ever — we will go out on a limb and make the following astonishing prediction: *None of the above will get as much of the popular vote* as *SyncSort just received in its election*. (Remember, you read it here first!)

Because this year — for the third time in a row — SyncSort OS won the "Great Sorting Election" by an overwhelming margin. Of the 4,000 OS and OS/VS users in the U.S., a whopping 62% — or 2,480 — chose to sort with SyncSort. (Not bad for a sort program that started out in a log cabin!)

And what about our competitor? Well, it's bad news for the three OS sorts sponsored by the Distinguished Gentleman from the Great State of Armonk. Together they only received 29% of the vote — down from 42% the year before.

The figures quoted are taken from the third annual sort-program survey conducted by the International Data Corporation. Here's what they found out about sort-program distribution in America:

	U.S. Market Share — Percentage		
	July 1, 1977	**July 1, 1978**	**July 1, 1979**
SyncSort	**43%**	**54%**	**62%**
IBM	**53%**	**42%**	**29%**
Other	**4%**	**4%**	**9%**

If you'd like a copy of the full report, please let us know. It's available to everyone, including IBM and hopeful politicians.

Why does the voting public prefer SyncSort OS by 2 to 1 over IBM's 5740-SM1, 5734-SM1 and that old "freebie" SM023? Well, we just have to fall back on that political cliche — leadership and performance in office.

Leadership because over the past decade we've come up with almost all the advances made in sorting. As a result, we're increasingly known as "*the* sorting house." And that hasn't hurt us a bit at the polls.

Then there's performance. If you benchmark SyncSort against any IBM sort, you'll notice a sharp decrease in the amount of computer resources that go into sorting. On average your "sorting taxes" will drop 20 to 50%

And do you know anyone who'll fight for higher taxes?

OVERSEAS REPRESENTATIVES—
Dusseldorf: SyncSort Technology GmbH,
Tel: 49-211-48-03-51
Johannesburg: Computing Benefits Ltd., 46-2083
Melbourne: Shell Co. of Australia Ltd., (03) 8400311
Milan: SYNTAX, (39-2) 87. 74. 44
Paris: CAP/SOGETI Produits, 33-1-539-22-25
Reading (UK): SyncSort Technology Ltd.,
44-0734-481919
Stockholm: BRA, 46 8 88 03 00
Tel-Aviv: ADVANCED TECHNOLOGY Ltd., 442697
Tokyo: Software Engineering Co., Ltd., (03) 446 1811
Utrecht: SyncSort Technology BV, 030-31-26-11

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COMPUTER SYSTEMS Inc. 560 Sylvan Ave., Englewood Cliffs, N.J. 07632

Radar Multiplexer Failures Delay Air Traffic

By Marguerite Zientara
CW Staff

ISLIP, N.Y. — Two out of three radar keyboard multiplexers (RKM) failed simultaneously at the Air Route Traffic Control Center (ARTCC) here at start-up Nov. 14, resulting in two days of air traffic delays at LaGuardia Airport and Kennedy and Newark International Airports.

The RKMs, which allow controllers to enter crucial and constantly changing altitude data into their computerized air traffic control system, failed because of a bad chip in a memory circuit of one and a couple of bad control cards in the I/O interface of another, according to Clint Murphy, chief of the Federal Aviation Administration's (FAA) Airways Facilities Eastern Region Division.

Because of the RKM failures, ARTCC management went immediately to broadband (noncomputer-based) radar to ensure a consistent air traffic control operations environment for controllers for the two days it took to diagnose and repair the equipment.

Reason for delays

The delays — up to one hour at LaGuardia and up to 50 minutes at Kennedy and Newark — stemmed from contrullers' inability to handle as many planes as they do when they have use of computer-generated data blocks on their radarscopes. These blocks identify planes by airline, flight number, altitude and ground speed.

Emphasizing that at no time did the center's IBM 9020D or 9020E processors fail, Murphy noted that all airplanes were controlled "very safely, without incidents or problems."

The malfunctioning of RKMs No. 1 and 3 became obvious at 5 a.m. Wednesday morning, when the system was being brought up. The system became fully operational again at 3 p.m. on Friday, Nov. 16, and has run smoothly ever since, Murphy said early last week.

RKM No. 1 is associated with the first 30 sectors, or radarscopes, at the center, RKM No. 2 is linked to the second 30 radarscopes and RKM No. 3 is a spare machine.

Dangerous Transition

"At any one time we could have provided 30 radarscopes with [digitized] narrow-band radar, but we chose to go broadband [while troubleshooting] so the controllers wouldn't have to be switching back and forth," Murphy explained.

Air traffic controllers contend that, while cuntrolling can be done effectively without computer-generated data blocks to identify radar blips, it is the transition between automated and broadband systems that can disorient a controller and cause him momentarily to lose control of his airplanes [CW, June 18].

"That's the reason we came up the way we did, so we wouldn't come up with a piece of bad hardware in the system, which would have been dangerous," according to Ian Wolfe, computer officer at the Islip ARTCC. The danger, he explained, would have resulted from the fact that [the system] could fail unexpectedly.

Air traffic delays on the second day of the outage approached 40 minutes at LaGuardia and were under 30 minutes at Kennedy and Newark, according to a spokesman in the operations branch of the FAA's Air Traffic Division, Eastern Region.

Other Airports Affected

Satellite airports associated with Newark were also affected, including one in Peterborough, N.J., and one in Morristown, N.J. Westchester Airport, closely associated with LaGuardia, was also affected.

There were no air traffic delays on Friday, Nov. 16, the spokesman said.

FAA Blasted for Threatening Air Safety

(Continued from Page 1)

loaded or may fail during critical situations," he said.

Breakdowns Increasing

Noting that instances of documented breakdowns of air traffic control computers are increasing, Leyden claimed that controllers are "more apprehensive than ever that they will be party to their gravest concern — namely, involvement in an actual mid-air collision."

He noted, too, that the FAA's present plan is to have new equipment installed in 1985, "at which time it will already be obsolete by presently accepted standards."

In addition, the FAA's reliance on broadband noncomputerized radar systems as backup in instances of computer breakdowns is unacceptable because "most present-day controllers have had minimal training or experience" on broadband systems, Leyden contended.

While commending Congress on its "foresight" in scheduling hearings on the matter starting today, Patco called on the President and Congress to "take immediate steps to accelerate the introduction of new computer equipment and tu undertake a complete modernization and repair program for air traffic computer equipment.

"The FAA's traditional policy has been to react after a disastrous event," Leyden asserted. "It is time for a change in FAA philosophy and direction."

Pilots Concerned

In a companion presentation, Capt. J.J. O'Donnell, president of the Airline Pilots Association, noted that "air carrier pilots are similarly worried by the constant outages of systems that lie at the heart of air traffic safety."

Observing that the Leesburg ARTCC computer outage on Oct. 31 "could have resulted in the threat pilots fear most — a mid-air collision," O'Donnell concurred that "the [air traffic control] system, even with all its redundancies, is not totally reliable."

While the FAA has made no formal response to the charges, an FAA spokesman said, "We feel that the system is safe, and we feel that the computer outages — while we're concerned about those that last more than a minute — do not constitute an unsafe situation.

"We feel certainly that it's less efficient, but we don't feel that it's unsafe," he added.

Controllers, however, contend that it is not the length of the outage that constitutes a dangerous situation. Rather, they argue, it is the mental transition controllers must make between working with an automated system and working with a broadband radar-based system that can cause momentary disorientation and the possible "loss" of the controller's airplanes.

As for Patco's call to speed up plans to acquire new air traffic control computer equipment for centers around the country, the FAA spokesman said the agency has no such plans. "We're going at just about the pace we feel we can honestly and safely go at this time," he said.

NBS Workshop On I/O Standard Gets New Date

GAITHERSBURG, Md. — To permit wider participation, the National Bureau of Standards (NBS) has rescheduled its technical workshop on federal input/outut (I/O) computer interface standards to March 3-4 at NBS headquarters here.

The workshop originally was set for Nov. 1-2 this year.

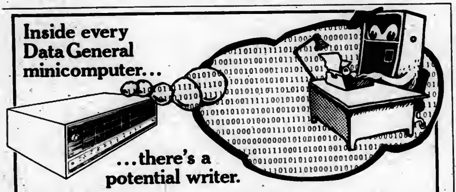
Topics will center around Federal Information Processing Standard (Fips) 60, the I/O channel interface standard, NBS said.

Topics for Discussion

The following issues will be discussed:

- Techniques for implemetiting this standard to support data transfer rates in the 5M- to 10M byte/sec range.
- Electrical, logical and other limitations of Fips 60 relative to data transfer rate and other performance constraints.
- Suggestions for new operational specifications standards to accompany Fips 60, such as for new classes of magnetic disk storage systems.
- Ways of specifying the necessary channel-level device interface characteristics to assure interchange of peripherals and to allow peripheral subsystems to have open-ended storage capacity and other enhancements such as buffer storage.

Individuals wishing to give a technical presentation in an open workshop format should send a one-page abstract by Jan. 15 to William Burr, NBS, Technology B212, Washington, D.C. 20234.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For 370, 30 Series Users

IBM Offers Hardware Unit for Encryption

By Brad Schultz
CW Staff

WHITE PLAINS, N.Y. — IBM has given users of its 370 and 30 series mainframes added security for stored files and transmitted data with a hardware device and companion software that assign a unique encryption key to each file or message.

The keys used to encipher or decipher data are enciphered themselves by the Model 3848 Cryptographic Unit from IBM's Data Processing Division. Supported by the Cryptographic Unit Support Program (Cusp), the 3848 stores key-encrypting keys under a master key in the user's host system.

This hierarchical scheme is intended to confound the cleverest attempts at surreptitously tapping or altering a user's information assets. The products significantly extend IBM's involvement with the burgeoning DP security arena at a time when many large users are considering encryption for the first time.

DES Used

Implementing the federal Data Encryption Standard (DES), an algorithm IBM developed a few years ago, the 3848 enciphers or deciphers data in two identical elements simultaneously and then compares results to minimize the occurrence of undetected errors.

The device runs under IBM's OS/VS2 MVS operating system and fits Systems Network Architecture (SNA) environments. Featuring a 4K-byte data buffer, its maximum throughput is 1.5M byte/sec, the spokesman said.

Like similar products from other vendors, the 3848 attaches to the mainframe via a block multiplexer or selector channel and employs block chaining.

That scheme futher obscures the patterns characteristic of highly structures plaintext — the text in normal form — such as a company's proprietary software or an agency's sensitive dossiers. After intercepting encrypted data, would-be thieves or saboteurs usually search for the merest suggestion of patterns in the bit streams.

Withstands Power Outages

The 3848 was designed to withstand power outages. The user-selected master key is maintained in a special storage element protected by a battery during power-off periods, the spokesman stated.

IBM has outlined the following "customer responsibilities" for using the cryptographic processor:

- The user must select the master key. However, Cusp can generate the key-encrypting and data-encrypting keys.
- The user should still provide physical protection for the host computer system. Only authorized users should have access to the 3848 and Cusp.
- Finally, users should maintain secure duplicate copies of key-encrypting keys.

"A lost key precludes decrypting and results in loss of data," the spokesman explained.

Personalization Needed

Moreover, to enter the master key and employ certain service functions, a "Personalization/Key Entry Unit" must be installed at each site having at least one 3848 device.

The Model 3848 Cryptographic Unit costs $48,750. It may be rented for $1,763/mo or leased under a two-year plan for $1,500/mo. The monthly charge for Cusp is $250, and the required Personalization/Key Entry Unit costs another $265.

These products will be available in the second quarter of 1980.

Calcomp Denied Trial Rehearing

SAN FRANCISCO — A federal appeals court here has upheld its June decision to deny a rehearing of a trial court's 1977 directed verdict decision that dismissed California Computer Products, Inc.'s antitrust suit against IBM.

After the original directed verdict was handed down, Calcomp filed an appeal asking the appeals court to reverse the directed verdict and grant a new trial.

Last June, the appeals court upheld the 1977 directed verdict. Calcomp then filed a petition asking the court to rehear its decision.

Calcomp had no comment on the appeals court decision.

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Small Antenna Could Cut Transmission Costs

(Continued from Page 1)

solid-state components, which reduce costs and improve system reliability "significantly," the DOC spokesman explained. The antenna was designed for FM analog transmission, he added, but is convertible to digital mode.

DOC officials believe their new earth station, despite its limitations, is a significant milestone along the road to inexpensive rooftop antennae capable of exchanging voice and data messages directly with satellites. The underlying technology will almost certainly produce further improvements in both cost and performance.

Tryout Planned

DOC plans to have 10 to 20 of the antennae built and then try them out using Canada's "Anik B Satellite. Launched in December 1978, Anik B has 12 two-way 6/4 gHz commercial channels and six two-way 14/12 gHz channels, all of which are for experiments.

Fourteen other tests are currently planned on Anik B. One of them, a collaboration between DOC and CNCP Telecommunications, is aimed at developing "an advanced time-division multiple access [TDMA] system" which could be the forerunner of new commercial data services.

A likely offering is a service that would provide the user with a common digital channel over which it could transmit voice and data messages concurrently.

Integrated transmission of these two, along with slow-scan video — which might be used for teleconferencing — is a primary focus of the upcoming test. The experiment is scheduled to begin next October and terminate the following February.

Test data will be transmitted among four Canadian cities — Montreal, Ottawa, London and Toronto — using on-site earth stations having antennae as small as 3.7 meters — a little over 12 feet — in diameter.

The terminals to be used in the experiment will operate at speeds ranging from 2,400- up to 1.544M bit/sec. All of the terminals will employ RS-232C interfaces.

Optional Exercises

Voice transmission in digital mode at 32K bit/sec and slow-scan video transmission at 1.544M bit/sec are among the options to be exercised.

The TDMA multiplexing scheme will provide 50 frame/sec and utilize a pre-assigned but variable accessing method that allows voice, data and video to be intermixed within a single time slot and/or among separate slots assigned to the same station. Slots can be reassigned without requiring any hardware changes at the terminal.

Error performance is another parameter to be tested. The goal is an error rate of 10^{-4} for 99.9% of all transmitted bits which contain no error-checking codes and a rate of 10^{-6} for 99.9% of all transmissions that do contain such coding.

Package Gives Auditors Independence

(Continued from Page 1)

rity, Corum said.

Although Pansophic did not claim Panaudit will eliminate computer crime, it maintained that the package gives the DP auditor faced with a computer crime sufficient backup to prove he didn't do it. Panaudit contains a series of routines that keep track of the auditor's transactions.

In addition, Corum said Panaudit could eliminate the need for additional high-cost DP auditors and potentially cut the DP department's work load by 40% since requests from the auditing department would be eliminated.

Easytrieve Features

Panaudit uses Easytrieve's basic features, including free-form English statements, automatic report formatting and mathematical calculations. Added features include an automated coding structure; automated documentation; a data dictionary; a system ranking routine that established a priority schedule for systems to be audited; and such generalized auditing routines as integrity tests, data and time routines and utility routines, Corum said.

Other features directed specifically at the auditor include application programs to audit cash receipts and disbursements, payrolls, sales, accounts receivables and payables, inventory, general ledger and plant, property and equipment, Pansophic said.

Panaudit routines can also be used for statistical analysis, distribution analysis, frequency anslysis and System Management Facilities (SMF) and DOS/VS analysis.

Telephone Support Program

Because auditors using Panaudit will be doing much of their own programming, Pansophic has developed a telephone support program so auditors can ask specific questions about problems they encounter.

Panaudit is billed as an auditing system developed by an auditor for auditors, but the telephone support network will be staffed mainly by DPers. One auditor — Corum — will also be available for some more audit-oriented questions.

The support team is staffed by DPers, Corum explained, because the service is offered only to overcome technical problems. Questions on auditing are a corporate policy matter and should be determined by the user company, he said.

While Pansophic claimed Panaudit is better than other commercially available auditing packages because it offers auditors independence from the DP department, Corum admitted there may still be times when the auditor would have to ask the DP department to develop or run applications not yet covered by Panaudit.

Releases of additional package features are expected in the next year, but the vendor would not give further details.

Panaudit was designed for the same user base as Easytrieve — IBM 360, 370, 30 series and 4300 CPUs.

Panaudit costs $23,000 for DOS users and $29,000 for OS environments. It costs $17,400 for entry-level 360/40, 370/115 and 4300 systems.

Reduced rates are available for users already using other Pansophic packages, the vendor said from 709 Enterprise Drive, Oak Brook, Ill. 60521.

Bi-synchronous vs. Asynchronous

The Black Box protocol converter helps the lion lie down with the lamb.

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Meet on Micros Set Dec. 7

COLORADO SPRINGS, Colo. — Microprocessors and microelectronics and their effect on the computer industry will be the subject of a one-day conference here Dec. 7.

Sponsored by the Association for Computing Machinery (ACM), the conference will feature Dr. Charles Bass, vice-president and founder of Ungerman-Bass Co., who will discuss microprocessor-based local networks; Dr. Ted Fulton of Bell Laboratories, speaking on research efforts in Josephson digital circuits; Earl Gomersall, vice-president and director of operations; support for Motorola Semiconductors, speaking on the future of microprocessors; Chuck House, manager of Hewlett-Packard Co.'s Logic Analyzer Division; and Dr. James Kendall of NCR Corp.'s Microelectronics Division

The conference costs $30 for ACM members, $40 for nonmembers and $10 for full-time students, ACM Pikes Peak Chapter member Bill Holst said from 2850 W. Serendipity Circle, Colorodo Springs, Colo. 80917.

Afips Asks Award Nominations

WASHINGTON, D.C. — The American Federation of Information Processing Societies, Inc. (Afips) is currently accepting nominations for the Harry Goode Memorial Award, presented each year to individuals for outstanding contributions in the information processing field.

The selection of recipients is reportedly based on:

- A single contribution of theory, design or technique of outstanding significance.
- The accumulation of recognized contributions over an extended period of time.
- Educational contributions through academic activities or writings.
- Publication of papers or books that have a significant influence in the information processing field.

The names, addresses and telephone numbers of candidates and their specific contributions, as well as the names, addresses and telephone numbers of individuals who can provide additional information on the candidates, should be sent by Dec. 14 to the Goode Award Chairman, Afips, 1815 N. Lynn St., Arlington, Va. 22209.

To Serve Home, Business Users

Canadians Bouncing Teletext Off Anik Satellite

By Phil Hirsch
CW Washington Bureau

OTTAWA — Canada has committed $36 million to the development of a direct broadcasting service that enables home and business users to receive a wide variety of voice and information services directly from a communications satellite through small-diameter "rooftop" antennae.

Canada is the first country in the world, Communications Minister David MacDonald said, to put such a system into operation.

The satellite used in the project is Anik B, which Canada launched with U.S. assistance late last year. It has 12 6/4 gHz commercial channels and six 14/12 gHz channels — all of which have been dedicated to experimental services.

Since 14 gHz uplinks and 12 gHz downlinks will also be used by Satellite Business Systems and other U.S. satellite carriers in their upcoming offerings, the results of the Canadian project are being watched closely south of the border.

A major advantage of the 14/12 gHz band is that it allows use of receive-only (RO) earth station antennae having a diameter as small as 4 feet (1.2 meters) and possibly less. By comparison, the smallest RO antennae used in 6/4 gHz service, the band presently employed by commercial communications satellites, measure 12 feet (3.6 meters) and cost considerably more.

Stations in Place

By December, 40 RO earth stations will be in place throughout Ontario, receiving a variety of direct broadcast services, reported Dr. C.A. Franklin, acting assistant deputy minister of space programs in the Canadian government's Department of Communications (DOC).

Several of these earth stations are already in place and in operation. They are receiving home and classroom educational programs broadcast by the Ontario Educational Communications Authority (OECA).

About 25 of the 40 earth stations to be installed by the end of this year will serve individual homes; most of the rest will be linked to cable TV systems. Franklin indicated that about 30,000 homes and offices are likely to be connected to the network at that time.

"We hope to expand into British Columbia, the Yukon and Northwest Territories next year," he added.

Teletext is one of the services currently being offered by OECA. Using Telidon, a software-based system for coding TV images in binary form developed by DOC technicians, the authority is transmitting news, sports, film reviews, library information and a variety of other services to several home TV sets.

Each TV set is equipped with a keypad about the size of a pocket calculator. The viewer uses the keypad to input codes indicating what information he wants; the codes program the teletext interface unit to "grab" the related information frames as they are broadcast repetitively via satellite from a central, computerized data base.

DOC has purchased 100 small-diameter earth stations from SED Ltd. of Saskatoon, Sask., for use in the direct broadcasting service test. The earth stations are tunable over the full 500 mHz range of the Anik B's 12 gHz downlink and have a diameter of 4 or 6 feet, depending on location. Each antenna costs approximately $2,500.

Production runs of at least 10,000 of these units would be required to get the per-unit price down to $1,000. More than 100,000 would have to be ordered to push the price as low as $600, according to a DOC spokesman.

Two-Footer Tested

However, DOC is continuing to search for even smaller, less expensive earth stations. With the help of an engineering expert from the University of Manitoba, Prof. Lotfollah Shaffai, it has come up with an aluminum dish 2 feet in diameter.

The 2-foot antenna has been tested successfully indoors using signals from the Hermes/CTS satellite, a predecessor of Anik B which was used jointly by the U.S. and Canada to conduct a number of satellite communications experiments. Anik B delivers a weaker signal, however, and cannot communicate with the Shaffai antenna in its present form.

Although many of the experiments included in the Anik B test series involve entertainment TV, some encompass data communications and others involve teleconferencing. The British Columbia Ministry of Education, for example, is testing an interactive educational communications network which links a central studio with six communities.

A somewhat similar experiment, which encompasses both audio and video teleconferencing, is being conducted by the University of Montreal.

Many of the data communications and direct broadcast services being tested on Anik B are expected to be ready for commercial implementation when Canada puts its next satellite series, Anik C, into operation. The first of three "Ceebirds" is scheduled for launch late in 1981 and will begin commercial service early in 1982.

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Police Files Omit Case Dispositions

By Maguerite Zientara
CW Staff

PITTSBURGH, Pa. — While the Pittsburgh and Allegheny County Criminal Identification System's computerized index will include descriptive data on all people arrested, it will not contain any record of the dispositions of cases.

For disposition information, officers will have to refer to the microfilmed data, which contains the arrest record, the arresting agency, all information pertaining to the crime and the final disposition of the case, according to Detective Ronald R. Shaulis, head of the Identification Section of the Pittsborgh Police Department.

"In keeping with the current Privacy Act, if any cases in the index included disposition information, all cases would have to include their dispositions," he explained. And since some of the agency's older arrest records do not include disposition data, the agency kept all such data out.

As for people who were wrongfully arrested for crimes they didn't commit, but who may have been indexed in the computerized file prior to a case's disposition, "they have the legal right to go ahead and get it expunged through the courts — that's been open to people for many, many years," Shaulis said.

Although the right exists, little is done to inform people of that right. There are signs posted conspicuously in the Identification Section telling of the right to expunge records, "but it's not up to us to inform them [verbally] of that," Shaulis said.

"As a matter of fact, as a police agency, we're nor permitted to talk to them about the charges or anything else," he noted. "It's just our job to fingerprint, mug them and take them before the courts for arraignment."

Criminal 'Jacket'

When an arrestee in any of the 130 Allegheny County police municipalities is taken to the Identification Section, "We fingerprint him, photograph him, microfilm the arrest report and start a criminal 'jacket' for him," Shaulis said.

The jacket, or file, is coded and stored in the microfilm retrieval system, and the arrestee's name, height, weight, other physical descriptors and type of crime allegedly committed are indexed in the computerized system.

From that point, the arrestee "is lying there in wait as a possible suspect," Shaulis said. And whether the arrestee is ultimately convicted or exonerated for his alleged crime, "dispositions don't mean anything when you're looking for suspects."

"Just because [an arrestee] was turned loose on his first burglary charge doesn't mean anything [in relation to] physical descriptor searches," he added.

Besides being a tool in compiling lists of suspects, the Identification Section's data is also osed as a pretrial information source by the District Attorney for Allegheny County "so he can actively prosecute those people," Shaulis said.

While the current situation may not inspire confidence in the hearts of those falsely arrested, a new Privacy Act is now being written by the State Legislature that may change procedures.

"We may have to change our whole plan of action after the new law comes out," Shaulis noted.

The law could mandate entering disposition data within 90 days of the completion date of any court action in a criminal case, Shaulis said. In addition, it could disallow the maintaining of any arrest record without disposition data.

Commtex Releases Net Monitor Used by NBS

(Continued from Page 1)

erations process." These elements are:

- Physical site/packaging requirements.
- Internode operator communications.
- Monitor/alarm and supervisory control mechanisms.
- Diagnostics for network maintenance.

Net/Alert reportedly uses sophisticated color graphics to monitor the performance of every terminal on every line in a data network, flashing "red alerts" when bottlenecks are at their worst [CW, Oct. 22].

Strategic elements of network management and control comprise the other process — network management per se — in Parker's model. These elements are:

- Work order management.
- Performance and reliability measurement.
- Cost accounting.
- Traffic/network engineering.
- Network security.

Parker contends that the CTX-100 stands alone in the strategic monitoring arena — a point rival vendors might dispute since their offerings also log line utilization and are meant to support network engineering. Parker's distinction seems to hinge on the scope of the logging and the sophistication of algorithms for processing such data.

The network manager needs "valid statistical measures of user traffic profiles, which the queuing theorists must use to accurately predict the consequences of design alternatives," he observed.

In a recent conference paper, NBS indicated that its Network Measurement Instrument was built because "performance measurement techniques. which indicate internal measures of performance are essentially meaningless to a remote user."

Instead, "the user is more concerned with the visible amount of work performed and the cost of the interactive service," NBS said. "Examining performance from a user's viewpoint leads to external measures of performance."

So what does the CTX-100 do specifically? Parker identified three typical "modes" of the product in a letter to a prospective state government user.

First, the "Trouble Ticketing Mode" is said to resemble a process Parker helped implement on the federal Social Security Administration's network. The mode is claimed to "pinpoint" high failure rate components and system design areas that would benefit from addition of redundant components.

Second, the "Network Modeling Mode" reportedly implements various queuing and reliability engineering formulas.

Finally, the "Traffic Analysis Mode" supports performance - measurement functions. "Analytical or intuitive designs . . . often produce systems [requiring] real work loads [to] be operationally 'throttled' to compensate for the unforeseen quality of actual system performance," Parker said.

With a minimum cost of about $75,000. the CTX-100 is right in the thick of the competition Parker named. Commtex is located at 2411 Crofton Lane, Crofton, Md. 21114.

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Dec. 3-4 Conference To Eye Data Flow Cost

WASHINGTON, D.C. — How international data protection legislation will affect the corporate pocketbook will be the subject of the second annual Transnational Data Flows (TDF '79) Conference here Dec. 3-4 at the Embassy Row Hotel.

John Eger, former telecommunications advisor to President Gerald R. Ford, and Hugh P. Donaghue, Control Data Corp. vice-president and assistant chief executive, will cochair the conference, according to its sponsor, Information Gatekeepers, Inc. .

Subjects scheduled for discussion include: U.S. and European positions on privacy, security and data protection; new technology; and how the world economy will affect transnational data communications in Europe, the U.S. and Canada.

Aimed at multinational organizations, common carriers that provide transoceanic DP transmission, service bureaus, software vendors and those involved in scientific, political or commercial communications, the conference costs $395, Information Gatekeepers said from 167 Corey Road, Brookline, Mass. 02146.

Replacing 90,000 File Folders

Microfilmed Police Files Help Pinpoint Suspects

By Marguerite Zientara
CW Staff

PITTSBURGH, Pa. — Ninety thousand bulging file folders stuffed into 89 file cabinets are being replaced by computerized and microfilmed information in the Pittsburgh Police Department's Criminal Identification Section.

Housing 200,000 microfilmed arrest records dating back to 1951, a single storage container the size of a small car will replace the 89 file cabinets, according to Detective Ronald R. Shaulis, head of the Identification Section.

The system is expected to speed up apprehension of criminals, processing of arrestees and criminal case clearance.

The computerized information comprises an index to the microfilmed records, which are cross-indexed by such entries as name, height, weight, other physical descriptors and the type of crime allegedly committed.

The information is used to establish lists of suspects in misdemeanor and felony offenses. It is also being microfilmed from an additional 365,000 "dossiers," some dating back to the 1920s, that were previously stored in the basement of the Public Safety Building and in other public buildings, Shaulis said.

Estimated to include over 450,000 cases, both civil and criminal, the Pittsburgh and Allegheny County Identification System will enable law enforcement officers to track down suspects more efficiently in serious crimes. "Right now we've got a manual system where we've got a lot of data on people but have no way to physically search it according to physical descriptor or crime category," Shaulis said. The computer is expected to change that.

Random Storage

Transferred to microfilm from hardcopy arrest records, the criminal history information will be randomly stored in the car-sized cabinet, ready to be accessed by 20 Bell & Howell Inc. microfilm readers and three 3M Corp. 500-F reader/printers.

A Burroughs Corp. B1800 computer with 512K bytes of main memory and two 130M-byte disks will be used to maintain the numerically coded index to the microfilmed arrest records.

The system also includes a Burroughs 750 line/min printer as well as a 30 char./sec printer. Twelve Burroughs TD-830 CRT terminals will be located throughout the county so police officers can input information on newly processed prisoners as well as access data.

Also merged into the system are crime records used by Allegheny County, in which Pittsburgh is located. The county previously maintained 157,000 duplicates of city criminal records in addition to 293,000 file folders of its own, Shaulis noted.

Dozens of Identifiers

While cases were previously indexed only by name and fingerprints, the $525,000 computerized index and rapid-retrieval microfilm arrangement will cross-index the 200,000 most recent city and county files by dozens of identifiers.

Identifiers include such additional characteristics as age, race, eye color, complexion, weapons or tools used in committing the crime(s), language accents or speech defects, how a criminal presented or disguised himself and fetishes.

"This will really have a dynamic impact on law enforcement in Allegheny County," Shaulis said. "For example, if there's an armed robbery and the victim gives a physical description of the perpetrator, an officer can input the description into the computer and get from it a list of 30 suspects.

"So you show 30 photographs to the victim," Shaulis continued. "He or she might pick two of them out as the actors on the case."

Detectives on the case would then go to the Identification Section and ask for the microfilmed information on the suspects, review their arrest records, get arrest warrants for them and make the arrests, he said.

Remote Access

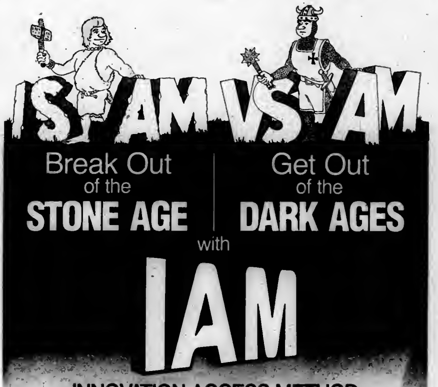
If a police officer happens to be at a remote police station and wants to check the criminal history of someone he has legally detained, he can request the information over the telephone, Shaulis said.

"The officer must give his name and the ID number of his station, and then we'll call him back with the information," he said. "We won't call an officer at home or at any number that isn't in our index of approved numbers."

As for physical security measures, there will be designated "command consoles" for adding, changing or deleting information, Shaulis explained.

Expected to be fully operational by Jan. 1, the project is being fuoded for the most part by a $450,000 grant from the Law Enforcement Assistance Administration, obtained through the Governor's Justice Commission.

"The big thing is getting all this stuff keypunched," Shaulis noted. The agency is using an outside bureau for that task and is presently putting the data on tape. It plans to transfer all the data to disk when the system starts.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DEC Yet to Deliver Advertised WP Features

By Marcy Rosenberg
CW Staff

MERRIMACK, N.H. – Digital Equipment Corp. advertised features for its floppy disk-based word processing (WP) systems that it has yet to deliver, the firm admitted last week.

At issue are claims relating to floppy disk hardware and certain software performance features said to be available with some of DEC's WS word processing systems and WD word and data processing systems.

Sales brochures circulated to end users and OEMs last year stated the WS80 and WD80 series systems came with RX02 diskette storage subsystems – the company's single-sided double-density floppy disk drives – and with automatic page formatting and numbering. Although DEC made similar written claims for other WS and WD models, these features won't be available for word processing until 1980, according to Les Dole, the company's sales programs manager for word processing.

Meanwhile, a number of end-user and OEM customers ordered WD and WS systems based on these specs, and some are still waiting for adjustments from DEC.

The erroneous claims "got into one piece of literature and it was a mistake," Dole conceded, adding "the document could have gotten to anyone, but we don't know how wide a distribution it had before we pulled it back."

Explaining the error, Dole said that when the RX02 was first introduced in 1978, DEC intended to eventually replace all RX01 single-density floppies with the then-new drive, which can be hard-wired to operate in single- as well as in double-density mode. The reason? "It's cheaper to produce one floppy disk drive that performs all functions," he said.

However, to avoid incompatibility with its installed base of RX01s in WD and WS systems, DEC chose not to rewrite word processing software to operate in a double-density mode Dole explained. Plans, therefore, were to market RX02 hardware as a double-density floppy disk drive for data processing applications and as a single-density drive equivalent to the RX01 for word processing.

But these plans were soon tabled, and DEC has yet to ship any WS or WD system with an RX02. Denying rumors of engineering and software problems with the double-density drives, Dole stated the firm decided to stay with the RX01 for the following reasons:

- DEC had a substantial inventory of RX01s.
- Whereas RX01s and RX02s operating in single-density mode are IBM-compatible, RX02s operating in double-density mode are not.
- A double-density RX02 only buys the word processing user a 50% increase in functional storage capacity over single-density because of the way files are structured.

As for automatic page formatting and numbering, "We don't have it," Dole said. "Our engineering people thought it would be ready sooner, but they fell short of their estimate."

When will this software feature – still in the development stage – be ready? "In the next six months – hopefully," he said.

No General Announcement

While DEC revised sales brochures in 1979 to reflect the availability of RX01 and to eliminate automatic page formatting and numbering as a feature on WD and WS models, it made no general announcement to OEM or end-user customers. Instead, the firm depended on its branch sales to inform customers of the errors when they placed orders, Dole remarked.

While many customers were so informed, others were surprised to learn that what they ordered – per the original brochure – was not what they received.

For example, one user in the Chicago area that asked not to be named ordered a WD80 system with a 1M-byte dual RX02 disk drive from an OEM last year, but received the gear with a 512K-byte dual RX01.

Only last month did the user reach an agreement with DEC whereby the firm will supply an additional RX01 dual drive unit at no cost and, in March, allow the user to trade in its WD80 for the higher end WD200 model for $10,000. The WD80 normally lists for about $18,000; the WD200 lists for about $41,000, carrying an OEM price of about $38,000.

Similarly, an OEM in New York ordered 14 WD80s in fourth quarter 1978 and received the first two systems without the RX02 as advertised. The firm canceled the balance of its orders and was able to sell the two WD80s configured with RX01 drives, but only after it found two other customers that didn't need 1M byte of storage.

Failure to deliver on what was interpreted by some as the claim of double-density floppy disk storage capability for word processing has cost DEC a handful of OEM orders, Dole admitted. And in other cases, "We've had to give equipment away or offer discounts on additional RX01 drives," he added.

Starting in January, however, Dole said DEC will provide RX02 hardware for WD and WS systems, as originally planned, the drives can operate in double-density mode for data processing only.

While users of WD Series machines – which are capable of word and data processing – can take advantage of the increased storage capacity for data processing applications, they will to trade off IBM compatibility. If end users or OEMs want IBM compatibility, Dole explained, they will have to run the RX02 in single-density mode "and give up same storage space."

Price may be another catch. The good news is that while DEC charges a "bundled" price for WD and WS systems with one dual floppy unit, the cost to add a second RX02 – $3,900 – will be less than to add a second RX01 – $4,500.

The bad news is that even after RX02s become available for word processing, DEC has no plans to reduce the price for a base WD or WS system. In fact, "We may chose to make more money on it," Dole commented.

Asked whether DEC will halt RX01 production after RX02 hardware becomes available for word processing in January, Dole said the firm will continue to make the single-density floppies, "but I can't say for how long."

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Is Computerese Gobbledygook?

Ruth Schiff Winett

The rapidity with which standardized computer nomenclature has developed during the past 30 years is remarkable. Descriptive and functional, computer language consists for the most part of terms that are variations and combinations of common English words.

This is the ninth in a series of articles on better writing.

Consequently, since computer terms have developed according to traditional language principles, gobbledygook in computer-related articles probably stems from the use of bad writing practices (dangling modifiers and run-on sentences, for example), and not from the use of an obscure vocabulary.

When the industry was in its infancy, what were some of its language requirements, and how were they met? Some of the major types of terms needed were nouns describing "hardware" ("computer," "memory," "display"); nouns describing procedures ("software," "program"); verbs relating to these procedures ("to program," "to read in"); names of quantities of information ("bit," "byte"); and names of occupations ("programmer," "systems analyst" and "operator"). These new terms needed to be listed and defined.

The first computer glossary appeared as early as June 1954. Entitled "First Glossary of Programming Terminology," it was published under the auspices of the Association for Computing Machinery's Committee on Nomenclature, of which Grace M. Hopper was chairwoman.

Two fairly recent glossaries are *The Glossary of Computing Terminology* by C.L. Meeks (CCM Information Corp., 1972) and *Standard Dictionary of Computers and Information Processing* by M.H. Weik (Hayden Book Co., 1977).

From scanning these glossaries, one can see that nomenclature was developed by borrowing terms, by stipulating new meanings for old words, by adding prefixes and suffixes to old words, by forming self-explanatory compounds and, occasionally, by forming new words.

Many of the borrowed terms — "algorithm" and "binary," for example — come from mathematics. "Closed shop" on the other hand, is a term from the field of labor relations.

Another method of developing nomenclature is to give new meanings to old words: "memory," "operator," "program" (noun and verb), "terminal", and "interface." "Interface" has long been a part of the language but, until recently, it was used as a noun, not a verb.

The ubiquitous "bug" (compare with the cliche "fly in the ointment") exemplifies how new meanings may be stipulated for old words.

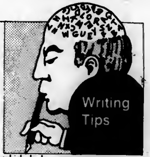
Hundreds of words were created by adding prefixes and suffixes to basic English words. Some of the words based on familiar roots and newly combined with prefixes are "debug," "minicomputer," "multiprocessor," "reprogram," and "interactive."

"Computer" and "compiler," on the other hand, are verbs transformed into nouns by the addition of "er", a suffix which is more commonly used with persons than with things.

"Locate" underwent several transformations before becoming the noun "relocatability" ("re," again; "locate," to place; "able," able; and "ity," the quality of have been joined together.)

Sometimes a verb is transformed into an adjective such as "reenterable". However, hybrids such as "reenterable" and "relocatability" offend language purists and, perhaps, some technical people.

Fortunately, "reinitialize," a term which had some currency 12 or 13 years ago, seems not to have caught on.



Still another type of word is the self-explaining compound: "tape drive," "disk pack," "time-sharing," "read-in," "high-level language," "store-and-forward switching," "breakpoint" and, finally, "on-line."

In contrast with the self-explaining compounds are such abbreviations, contractions and acronyms of "PL/1," "Fortran," "Cobol" and "bit."

While true coinages are extremely rare, one made-up word — "byte" — is an essential part of the vocabulary. Three other expressions are not actually coined words; rather, they are words derived from the names of individuals: "Hollerith cards" (after Her-

(Continued on Page 12)

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Isolation Seen Human Fate in Office of Future

By Jeffry Beeler
CW West Coast Bureau

SUNNYVALE, Calif. — Automated office systems will provide their users with many benefits, but they will also produce "sociological" side effects that deserve further study, a Xerox Corp. researcher predicted here recently.

By the 1980s, "office of the future"-type systems will allow many business managers to do their jobs without ever leaving their homes, according to Dr. Gary Nutt, a member of the research staff at Xerox's Palo Alto, Calif., research center.

Long-distance communications links will allow executives to tap their corporate data bases through small home computers, while electronic mail systems will permit them to communicate remotely with their staffs and colleagues.

But although automated office systems could make daily commutes to work nearly obsolete and eliminate many other inconveniences, they could also contribute to their users' isolation, Nutt said recently at a local chapter meeting of the Association for Computing Machinery (ACM).

"Most people would go stark raving mad within a week if they simply stayed at home with their personal computers and never went to the office," the speaker told an estimated 100 members of ACM's San Francisco Peninsula Chapter. "People need other people to talk to. The [family] cat isn't enough."

Citing some of the office automation field's other human implications, Nutt warned repeatedly of the dangers of imposing rigid business DP systems on their unsuspecting users. Office information-systems of the future must provide enough operational flexibility to avoid squelching the white-collar world's "informal communications," the speaker advised.

Informal communications, he explained, are administrative practices that deviate somewhat from accepted operating procedures. They arise naturally in almost every corporation and are nearly indispensable to smooth business operations.

Automated office systems that neglect to take informal communications into account will quickly incur the wrath of their users and will eventually fail through lack of acceptance, Nutt warned.

One of the prerequisites for an office information system's success, then, is an ability to preserve some of the human "social structure" that preceded its installation, the Xerox researcher added.

Another key to strong user acceptance is ease of operation. If clerical workers unversed in computing are forced to try to program their newly installed automated office systems, Nutt said, they will almost certainly rebel against them.

Computerese Not Gobbledygook

(Continued from Page 11)

man Hollerith); a "batten" or "peek-a-boo" system (after W.E. Batten); and a "baud" (after Baudot, developer of baudot code).

Evidently, DP professionals are as creative as they are pragmatic. Some of the more whimsical terms in use are "Fosdic" (shades of Fearless Fosdick); "squirrel-cage magnetron"; a "hit-on-the-fly printer" ("seven with one blow"); "stunt box" (a relic from Houdini); "floppy disk"; and the penultimate term, "standing on nines carry". What other professionals are as imaginative!

The degree to which computer jargon has entered the general vocabulary is a reflection of the degree to which DP has impacted modern life; everyone and everything, from students to sewing machines, must be programmed. All professionals, from politicians to psychologists, seek "input" before the "interface" with their colleagues.

And, finally, all plans must be "debugged" before they become "operational."

In conclusion, computer scientists have developed a highly effective professional vocabulary by employing some of the same linguistic principles that were used in England long before the time of King Arthur; borrowing, using prefixes and suffixes to form new words, forming self-explaining compounds and stipulating new meanings for old words.

New Words

In addition, data processors have occasionally coined new words. They have also expanded their professional vocabulary by using acronyms and abbreviations. The former is, of course, a popular space age method of expanding vocabulary.

Aside from some words which have too many prefixes and suffixes, most computer nomenclature is functional and even self-explanatory. In fact, this nomenclature is possibly more direct than medical, legal, psychological or political jargon.

Thus, when DP articles seem to read like gobbledygook, it is almost always the fault of the writer, not the terminology.

For readers generally interested in an etymological approach to vocabulary expansion, *Word Power Made Easy* by Norman Lewis (Pocket Books) is one of the best vocabulary books available. Lewis also provides spelling and usage tips.

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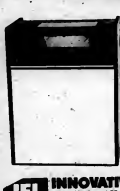

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Conference Features Library 'Alive With Information'

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The several thousand participants at last week's White House Conference on Library and Information Services were treated to a "room alive with information," an electronics information center — the conference's own library of the future.

As if to symbolize the struggle of libraries to incorporate state-of-the-art information technology, the center's approximately 400 reference books were ringed with an array of CRTs, acoustic couplers, tabletop computer printers and teletypewriters, offering access to any of more than 100 on-line data bases and a sophisticated teleconference operation.

The center, put together at a cost of about $500,000, was "designed to show conference participants what an up-to-date information center can do," according to conference director Marilyn K. Gell.

New Technology

"A significant part of the country's information is now on film or on videotape, in computer files or on microfiche and magnetic tape," Gell said in opening the center Nov. 15.

"The new technology is already part of some of our libraries. It is light years away from other libraries," because it requires "a change in attitude about what information delivery can do.

"Experience new technology cannot be offered for free," she added.

Embodying the issue of expensive informatiun technology and who pays for it were the center's banks of Hazeltine Corp. 1520 CRTs, Texas Instruments, Inc. Silent 700 send/receive bubble memory data terminals, various modems, Tally Corp. and TI tabletop printers and numerous display devices of varying sophistication.

Working Model

Described by conference chairman Charles Benton as "a working model for America . . . a model for an information-dependent society in the information age," the center was designed to fulfill four functions:

- The facility answered delegates' questions on "virtually any topic, from local Washington, D.C., happenings to legislation, education and finance," Gell said. The center was on-line to more than 100 computerized data bases to retrieve facts, statistics, references to publications and background information in support of conference work groups.
- On-line access was provided for the full texts of the 3,000 conference resolutions submitted by earlier state and U.S. territorial meetings.
- On-demand copies of information on tape cassettes or in braille were produced for handicapped delegates. A computerized "Kurzweil" machine, which translates from print to either synthesized speech or braille, was a highlight of this part of the center. There were also machines capable of providing braille transcriptions from a computer terminal.
- Internal conference communications were provided to monitor conference workshops and provide printouts to track their progress.

A mainstay of this function was the electronic information exchange system (EIES), based at the New Jersey Institute of Technology. EIES is a computer-based communications system currently linking some 700 persons in North America and Europe.

Users can send and receive messages, engage in electronic conferences, participate in joint work projects and use the system for their own computer-assisted work. The network was used by the conference organizers to plan the five-day conference [CW, Aug. 13].

Originally developed under a National Science Foundation grant, the system is based on Perkin-Elmer Corp. minicomputers and is open to new members at a monthly cost of $66.

The system received special attention from one VIP visitor to the information center, President Carter's daughter Amy, who used the EIES facilities to set up a teleconference with children at a school for cerebral palsy in Honolulu.

Developed and staffed by the Library of Congress, the information center was the focal point of the White House conference. As such, Gell said it represented "the information delivery capabilities of a library not of the future, but of today."

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Library Conference Struggles With Technology

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — It was billed as a library conference, but talk of books was notably muffled by talk of "access," "on-line data bases" and "computer output microfilm."

Why? "The library and information service field is in a state of flux. Traditional values and practices are being challenged daily by forces generated by increasing demands for service, new technology and rising costs," according to Charles Benton, head of the National Commission on Libraries and Information Science, a permanent executive branch organization.

"Computers and satellites offer opportunities for an array of choices that are mind-boggling and frightening," Benton said, pointing to such issues as privacy vs. access and the government's role in distributing information vs. copyright protection.

The scene was the recent White House Conference on Library and Information Service (WCLIS). Approximately 2,000 delegates and official observers met here to discuss the implications of Benton's statement and discuss about 3,000 resolutions on structuring libraries in the U.S.'s postindustrial information age.

Remarks by Carter

Benton's remarks were echoed by President Jimmy Carter, Addressing the conference Nov. 16, Carter pointed out that "information available to the world is exploding more rapidly that it can be accommodated."

Carter, whose first public office was that of a county library trustee, said that "instant access to information" is "particularly important in a democracy, where the strength of a nation depends to a major degree on a well-informed public. . . .

"In the past, our country has made some serious mistakes in war, in morality, in the functioning of government. In the few years before I became President, this was especially true, and in almost every instance, if those circumstances were analyzed, the errors or mistakes were made because the public was excluded from the process of making decisions of our own government."

Carter told the conference delegates that "we have made good progress in the last number of years in promoting the science of libraries, of information, of communications.

"Each generation is inclined to think we have gone as far as we can with television, instantaneous transmission of messages and photographs, satellite relay stations, but I would guess that the progress we make in the future, in the next 10 years, the next 100 years, will be just as rapid and startling as that we have made in the past."

President Carter stresses the importance of information in a democratic society and Amy Carter visits 'the library of the future' with a throng of other school children. Elsewhere in the same electronic information center, on-line access to about 100 commercially available data bases is demonstrated.

The conference, conceived 22 years ago, benefited from the participation of more than 100,000 persons around the country who met during the last few years to choose conference delegates and propose 3,000 resolutions for discussion.

For the five-day meeting, the resolutions were boiled down to five themes — library and information services for personal needs, for lifelong learning, for organizations and the professions, for governing society and for international understanding.

To match talk with action, WCLIS organizers set up their own working library of the future, an "electronic information center" that contained a few hundred reference books and the computer and communications equipment to access 100 data bases around the country, as well as to serve as the communications and recordkeeping link for the conference itself.

The information center and the conference as a whole were aided by a special information community advisory committee that included representatives from Control Data Corp., Texas Instruments, Inc., Tymshare, Inc. and IBM.

The results of the five days of meetings were presented to a special joint congressional committee, convened last Monday at the conference site to receive statements of immediate and long-range goals for increased library development and recommendations for achieving those goals.

A final conference report will be submitted to the White House within four months and to Congress shortly thereafter. The report will contain the contributions of the thousands of librarians, information managers, publishers, university professors, members of Congress and businesspeople who participated.

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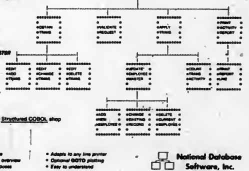

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Make Privacy Policy Voluntarily, Users Warned

By Jeffry Beeler
CW West Coast Bureau

LOS ANGELES — Users should seize the initiative in formulating DP privacy policy or run the risk of having federal data security legislation rammed down their throats, a member of the Business Roundtable's Employee Privacy Task Force recommended at a recent seminar here.

Almost all the seminar's speakers urged Congress to declare a three- to five-year hiatus on federal privacy legislation to give industry a chance to comply voluntarily with the Privacy Protection Study Commission's 1977 proposals.

If industry fails to adopt adequate data security guidelines by the end of the proposed grace period, the federal government would probably be justified in imposing its own policy on the private sector, the speakers agreed. Until then, however, each user should be allowed to pursue the policy course best suited to its individual business needs.

Task Force members repeatedly stressed the importance of taking steps to forestall pending and future federal privacy legislation. If users dally and leave the task of formulating data security policy to government, they could someday find themselves squeezed into a procrustean bed of federal regulation, the speakers said.

Intentions Good, But . . .

Many federal laws begin with good intentions but go awry during drafting and often "straitjacket" their intended beneficiaries with "arbitrary, unbending and inflexible regulations," according to task force member Randolf Aires, a senior attorney for Sears, Roebuck and Co.

To make matters worse, many federal (and state) laws contain huge, unforeseen expense items and thus cost private industry millions of dollars each year for compliance, Aires said. For this reason, the Sears attorney and most of his fellow task force members oppose enactment of federal legislation governing the protection of corporate data integrity.

Aires and the other speakers here issued their statements at the fourth in a series of five privacy-oriented seminars sponsored this year by the Business Roundtable, a group of 186 chief executive officers representing a cross-section of industries, including DP. The seminars are being held to publicize the Roundtable's proposed plan for safeguarding the confidentiality of employee data:

In essence, the Roundtable's plan — which closely resembles the Privacy Protection Study Commission's recommendations — calls upon users to:

- Maintain an open information policy by destroying secret employee files.
- Establish formal, written policies describing methods of collecting, storing, using and disseminating employee information.
- Guarantee workers the right to inspect all data files affecting their professional advancement.
- Permit employees to dispute suspected errors in their files and propose corrections.
- Obtain workers' permission before releasing personal information to outside organizations.
- Ensure the relevance, accuracy and timeliness of all employee data.
- Inform workers of all corporate information-handling practices.

These and similar recommendations surfaced repeatedly during the one-day seminar as several of the participating speakers recalled their own firms' efforts to formulate a fair but effective DP privacy policy. Some of the speakers presenting case histories of their companies', experience included Donald Devey, program manager of IBM's personnel information; Carl Holmes, AT&T's privacy administration supervisor; Jack Osborn, TRW Credit Data Corp.'s regulatory compliance director; and Ethan Davis, public affairs vice-president of the Prudential Insurance Co. of America.

At least three speakers predicted a growing interest in data security bills at both the federal and state levels. "Privacy legislation is definitely going to be with us for some time, but whether any of the proposals will be enacted into law is open to conjecture," Aires said.

Few of the privacy bills now before Congress deal with protecting the security of employee records, he said. Indeed, the most popular legislation concerns either the disclosure of medical records or the use of Social Security numbers as a universal identifier for indexing files.

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Consulting Firm Forms To Aid Women DPers

By Connie Winkler
CW Staff

NEW YORK — Women in data processing can be the leading edge of the new wave of working women, just as data processing is at the leading edge of industry, Denise L. Hassman believes.

Hassman recently rallied about 200 women and a few men for an introduction to Women in Data Processing, Inc., an educational consulting firm that sponsors seminars on technical and interpersonal skills. Hassman is president.

"Women are needed now, which puts you in an excellent strategic position to get what you want," Hassman said. "It's time for women in data processing to take advantage of the opportunities offered them."

Women in Data Processing is to provide the practical means for persons in DP to take advantages of opportunities, and three speakers suggesting ways to do that were Christine M. Millen, senior manager of management advisory services at Price Waterhouse & Co., Ann K. Leven from Chase Manhattan Bank and Iris E. Fodor, associate professor at New York University.

Changing Perceptions

"You have to get people to believe in you — to trust you to undertake work not previously performed," Millen said. Originally from Britain, Millen's first job in the U.S. was as a programmer for a large nonprofit insurance company.

"It isn't just proving you can do just exactly what men do; it is changing people's perception of you," Millen said. "You have to change them from thinking of you as a capable technician to someone who can be trusted with any project.

Millen said her rise to senior manager from programmer at Price Waterhouse was encouraged when she realized "I could get things done when others couldn't."

At times, it also helps a woman to have someone within the company who supports her. While not calling the person a mentor, "you need to find someone for whom you are doing good work — you are helping them and they are helping you over the rough spots," Millen said.

Getting out of the DP box into other areas of the company means a woman must persuade others she can do another job. Millen volunteered to put on her company's elegant Christmas party, teach other employees and travel for several-week periods despite her two children.

"Get out of the run-of-the-mill, doing-my-job-well situation," she urged. "You have to find some way to stand out — it is being attuned to what goes on in your office . . . Women have hang-ups about clinging to their basic skills."

Millen also suggested another perspective on dealing with male managers and co-workers: "Many of us fail to realize that men similarly have a difficult time dealing with us," she said. "They started working before women were taken seriously in the office. They may have had an assistant who cried in their office — they're nervous."

Life Plan

Leven is vice-president of corporate planning at Chase Manhattan and what she does for the bank she does for herself in terms of life plans every three or so years.

"You have to consider 'Where am I going?' 'Where have I been?' and 'What do I want out of life?' when considering a career," Leven said. She came to the bank after 12 years on the financial staff of the Metropolitan Museum of Art here and from teaching at the Columbia University of Business.

To develop a plan the women should first determine what success personally means to them, Leven urged. Secondly, they should look at themselves in terms of strengths and weaknesses and then third, in terms of research opportunities. She encourages students to read every periodical available to them.

Leven also suggested that while there may be no female role models in a certain area, there's no reason why a role model can't be a man.

Fodor recommended women tackle on-the-job problems in an assertive — not aggressive — manner. Too often women behave unassertively by avoiding a problem, by asking to be transferred out of a department or by badmouthing the other parties.

"They don't confront the issue and they subsequently have feelings of sadness and depression," said the psychologist who is active with assertiveness training groups for women.

"Being assertive means open, honest communication, risk taking, being upfront and putting facts on the table," Fodor said. "In the case of a problem with a supervisor, it means saying 'I think we had better talk. We don't seem to be getting along."

This is distinguished from aggressive behavior, which includes expressing anger and blaming others.

Women need to examine their behavior. "Know yourself," Fodor said. "If you are going to get ahead, you are your instrument."

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Lawyer Involvement in System Design Defended

By Howard A. Karten
CW Staff

SILVER SPRING, Md. — Are lawyers part of the system design team in your organization? If they're not, perhaps they should be.

In any case, it may become inevitable to have lawyer involvement in systems planning and design in the future. That warning was issued by the chairman of the American Bar Association's Subcommittee on Professionalism and Malpractice of Computer Specialists at the National Symposium on Computer Systems Enhancement, held here last week by the Data Processing Management Association's (DPMA) Education Foundation.

"The law has not been able to keep pace with advances in technology and the way information is disseminated," J.T. Westermeier Jr. said. Westermeier is with the law firm of Abrams, Kovacs, Westermeier, Goldberg and Mayberry in Alexandria, Va.

In a recent case, he said, punitive damages were assessed against an automotive credit acceptance company whose computer system incorrectly indicated that a borrower had not kept up with his auto payments. Although lawyers for the plaintiff attempted to place the blame on the computer system, the court rejected their arguments.

Credit operations of this type generally have been set up by lenders to provide legal insulation from suits arising from some defect by the seller or in the product. In recent years, the courts have chipped away at this insulation, expanding consumer rights.

"It is imperative that managers consider the legal aspects of systems because potential liability can be substantial," according to Westermeier, who has litigated several cases for DP clients. "A lot of software is incomplete or not fully debugged."

Part of the problem for suppliers of DP services — and possibly systems analysts and programmers — comes from the fact that computers are both getting faster and spreading their effects more widely. A case in point is the recent shutdown of five nuclear plants because incorrectly written programs did not properly calculate the stresses on plant components.

Since computers have enabled users to send around the world in nanoseconds information that is incorrect, systems planning and implementation must be viewed at least partly in a legal context, Westermeier said.

Contract Protection

Contract protection is highly important, Westermeier noted. The purpose of contracts is to allocate risks and penalties for the contracting parties.

In one recent case, a major mainframe vendor that Westermeier declined to identify refused to bid on a request for proposals issued by the Federal Aeronautics Administration unless the agency would grant the vendor legal immunity from suits arising from any accidents caused by the system, either working or not working.

"The key thing is that a contract should cover your situation. A [standard] contract cannot provide mutuality of protection — it's one-sided. Make sure your contract spells out clearly your rights and liabilities," Westermeier urged.

There are several potential pitfalls in contracts, Westermeier warned. Under the U.S. Uniform Commercial Code, which has been adopted by 49 of the 50 states, standard disclaimers of warranty will generally protect a vendor. However, the disclaimer will not overrule specific representations made in writing by a vendor.

Another pitfall regards the place where the service is to be performed. No state will enforce a law of another state, Westermeier pointed out, so a sticky situation could arise if a California seller, for instance, sold something to a New York buyer who provided a service in New Jersey and a suit eventually resulted.

In his own contracts, he said, he never uses the term "software" because it can be too broad or too vague. Instead, he spells out everything — down to training and manuals.

The argument about professionalism among DPers has some merit, Westermeier believes. DPers will be judged in these cases by a higher standard of care than the ordinary person because of the special expertise they possess and the dependency relationship that expertise creates, he said.

Afips Publishes Audit Checklist

ARLINGTON, Va. — How can a DP manager balance costs against benefits when formulating and administering a security policy? A book published by the American Federation of Information Processing Societies (Afips) may help you decide.

Afips will publish *Security: Checklist for Computer Self-Audits* in December. The 128-page book updates the previous Afips *System Review Manual* and emphasizes management involvement in system security, the organization said.

The book which includes a consideration of the special security problems encountered in a "distributed environment," is available for $25 to Afips and $35 to all otbers.

More information is available from Afips Press, Suite 800, 1815 N. Lynn St., Arlington, Va. 22209.

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Data base storage, for local applications processing. PTS/1200's are expandable from 10MB to 252MB of disk storage, with powerful memory management software techniques that assure efficient data base operations.

Network enhancement. A distributed processing system with truly enhanced capabilities should allow you to do more with your network than simply transfer data. PTS/1200 systems let you add teleprinters to your terminal lines, or run batch and interactive jobs concurrently, or perform remote program development in any host CPU language, or debug, load and operate downline multipoint lines.

Not bad features for a system that is priced starting at $850 a month, including maintenance, for a four-terminal, 10MB disk, 165 CPS printer configuration.

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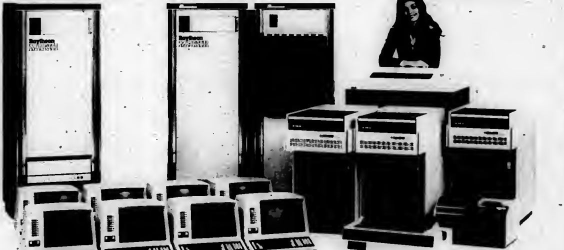

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Managers on the Move

ANTHONY J. GAMBATESE has beeo named vice-president of data processing at Blue Cross of Northeast Ohio in Cleveland.

Gambatese joined the company in 1954. He was first employed as an operator for electronic accounting machines. He was promoted to manager of planning in 1967 and then to DP director in 1976.

Gambatese holds a degree in business administration from John Carroll University. He also earned a certificate in advanced management from Case Western University.

• • •

ANTHONY J. MALOOL has been appointed director of information systems at Drew Chemical Corp. in Boonton, N.J.

In his new position, Malool will coordinate all information systems groups and will be involved in short-term and long-term planning.

Malool is working toward a B.A. in business administration at Fairleigh Dickenson University.

• • •

RONALD E. GRIFFIN has been appointed an operations officer in automated banking services at Atlanta's Trusco Data Systems (TDS), the statewide data processing organization of its holding company, Trust Co. of Georgia.

Griffin was employed by Trust Co. of Georgia in 1970, holding positions in the proof department and bookkeeping department.

He joined the TDS staff in 1977 as a bank services representative, the position he held prior to his recent appointment.

LORRAINE LESHKO, MARY LU GRAHAM and ALAN DeMICHAEL have received promotions at Supermarkets General Corp. in Woodbridge, N.J.

Leshko has been named manager of computer operations. She will be responsible for the administrative and production activities of both the computer operations and output control departments.

Leshko joined the company in 1972 as a data entry operator and has held various other positions in data processing prior to her recent appointment.

Graham has been appointed manager of computer services. She will be responsible for all management and administrative functions that encompass the operation of the company's DP facility. Graham holds an associate degree in accounting from Middlesex County College.

DeMichale has been named projects manager of the Information Services Department. He will be responsible for managing the activities of project teams consisting of analysts and programmers in the maintenance and development of manual and computer-based systems.

DeMichael joined the comapny in 1973 as a systems analyst and was later promoted to senior systems analyst, a position he held until his recent promotion.

He received a bachelor of science degree in business administration from Monmouth College.

• • •

MICHAEL WILLNOW has joined the site management team of Systems & Computer Technology Corp. (SCT) as assistant director for computer operations at Wayne County Community College in Detroit.

Willnow will be in charge of production control, the tape library and building maintenance and security for the college's Computer Services Department.

Before joining SCT, Willnow held positions in data processing in the Human and Social Services Department for the State of Michigan.

Willnow holds a Certificate in Business Management from Lansing Mich. Community College.

• • •

RANDY L. LEONARD has been appointed assistant vice-president of information systems at Gay & Taylor, Inc. in Winston-Salem, N.C.

Leonard joined the company in 1972 as a programmer. He served the firm as assistant manager and as manager of data processing prior to his recent promotion.

Leonard is a graduate of North Carolina State University.

• • •

MARY V. CAMPBELL has been named director of OS/MVS computer systems for Associates Corp. of North America in South Bend, Ind.

Campbell joined Associates Corp. in 1976 as a systems analyst and most recently served as senior systems manager.

Campbell studied accounting at the University of Georgia.

• • •

BENEDICT HRAPKO has been appointed assistant vice-president of Teachers Insurance and Annuity Association and College Retirement Equities Fund in New York.

As assistant vice-presient, he will be in charge of the management and operation of the fund's installations.

Hrapko is a graduate of New York Community College.

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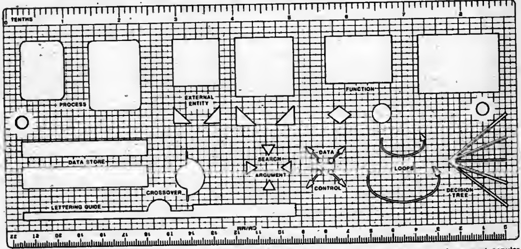

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EDITORIAL

Citizen Harassment at Stake

The Pennsylvania State Legislature, currently in the process of rewriting its Privacy Act, has within its grasp the power, opportunity and responsibility to protect wrongfully arrested citizens from future harassment by police agencies.

The potential for such harassment lies in law enforcement aids such as the Pittsburgh and Allegheny County Criminal Identification System's newly computerized index to microfilmed arrest records, some of which date back to 1951. The system was designed to aid police in identifying possible suspects in misdemeanors and felonies.

While the computerized index — providing a key to the randomly stored microfilm records — includes arrestees' names, physical descriptions and the types of crimes for which they were arrested, it does not include any disposition data.

The reason for such an omission rests with the state's current Privacy Act, which dictates that if disposition data appears on any case within such a file, it must appear on all cases within the file.

And since Pittsburgh and Allegheny County are dealing with records almost 30 years old, many of which do not contain disposition information, they have until now kept all such information out of the index system.

Available disposition information is included on the microfilmed records, of course, but that is no consolation to the person who is wrongfully arrested and immediately listed in the computerized index as an arrestee.

The State Legislature should act swiftly to mandate entering disposition data within 90 days of the completion date of court action in a criminal case and to disallow the maintenance of any computerized arrest record without disposition data.

Time to Reread 'Fail Safe'

Several dozen copies of *Fail Safe*, that gripping novel about accidental thermonuclear war triggered by a computer hardware failure, should be circulated among the Pentagon's top brass.

The book might aid the current North American Air Defense (Norad) Command investigation of why an experimental Honeywell, Inc. mainframe mistook a simulated missile attack as the real thing during a Nov. 6 test [CW, Nov. 19].

Advocates of the second Strategic Arms Limitation Treaty (Salt) now awaiting Senate ratification presume that computer systems can reliably verify compliance with specified limits on thermonuclear arms stockpiling. They generally assume that systems can also reliably verify whether a given superpower is about to annihilate another with missiles.

Such confidence in technology is even more significant to the Salt debates than confidence in Soviet compliance with the treaty. Blind faith in technology by either the U.S. or the Soviet Union could threaten both superpowers.

DATA PAST

Five Years Ago
Nov. 27, 1974

Southland Corp. and Computer Sciences Corp., two of the first U.S. users of the Western Union Westar satellite service, reported that they saved money while transmitting over higher quality circuits.

WASHINGTON, D.C. — The Federal Trade Commission ordered more than 320 career schools to pay back up to 75% of their students' tuition. The order applied to those students who paid more than $100 to take courses from the schools between 1969 and 1972, yet who never found a job substantially related to the field for which they had trained.

Eight Years Ago
Nov. 24, 1971

LAS VEGAS — Seventeen thousand people attended the "smaller but better" Fall Joint Computer Conference here, which was dominated by minimainframers and peripheral makers.

'Obviously they have no disagreement on the best way to use a computer. . .'

LETTERS

Persuasion Problem

As an example of unclear meaning in technical writing, Ruth Schiff Winett chose the sentence "Yes, we have no bananas" [CW, Nov. 12]. She described the sentence as ambiguous.

In *Webster's Dictionary*, "ambiguous" is defined as (1) doubtful or uncertain, especially from obscurity or indistinctness, or (2) capable of being understood in two or more possible ways. The sentence "Yes, we have no bananas" is not unclear; it means "Yes, we have no bananas."

This clearly is agreeing with someone who asks, "Is it true that you have no bananas?" The sentence certainly does not have more than one meaning, as should be clear from the previous explanation.

Winett should note that double negatives are not necessarily ungrammatical, and anyway, "Yes, we have no bananas" only has one negative.

I agree that clarity is a good objective for technical writing. Also, however, the level of interest must be maintained. Reducing a phrase or sentence to its basic meaning may well cause it to be prosaic and uninteresting. Worse, the finer shades of meaning may be lost altogether.

For instance, one remedy given in Winett's article suffers from both of the latter two problems. The supposedly bad sentence is "The absence of a good benefits package is a drawback when comparing one prospective employer with another." The "remedy" is "When programmers compare one prospective employer with another, they also compare the benefits package of the two companies."

These two sentences don't even have the same meaning. The first sentence says that the absence of a good, as opposed to bad, benefits package is a disadvantage. The first sentence also says nothing about programmers actually comparing packages — do they do this? Where did that idea come from?

The point is, it is absolutely OK to make sentences clearer, but one must be very careful not to change the meaning and, at the same time, to retain the reader's interest. Winett seems to be falling into the trap that many English teachers find themselves in. That is, to assume that excellent writing demands strict adherence to the rules of grammar.

It's difficult enough to persuade technically oriented people to read and sometimes create documentation. If the technical information is not only made dull and uninteresting by a technical writer, but also its meaning is changed, then the task of persuading the technicians to become involved with documentation becomes not difficult but impossible.

David King

Glendale, Calif.

Irked by IRA

Perhaps an analyst/programmer should consider a situation that has one less "benefit." The benefit in question is the company-funded retirement plan.

As long as an analyst/programmer is employed where there is a company funded retirement plan, he is prevented from setting up his own portable Individual Retirement Account (IRA). It is the lack of portability that is a detriment in the long run.

To remove the detriment, he should look to companies without a retirement plan and set up his own.

Arthur G. Rauch Jr.

Flurissant, Mo.

Computerworld welcomes comments from its readers. Letters should be addressed to Editor, Computerworld, 797 Washington St., Newton, Mass. 02160.

READER COMMENTARY/Anthony F. Vignone

GOTO 'Outbursts' Ignore Central Design Issue

The structured Cobol coding arena has been relatively quiet until the recent outbursts from Pacifico A. Lim [CW, Oct. 1], Bruce Sherman [CW, Nov. 5], John Siegel [CW, Oct. 15] and Alan Taylor [CW, Nov. 5]. Because of the specific and microcosmic nature of this topic, I believe it should have remained quiet. It should at least take second place to more important topics on structured methodologies.

These articles magnified the subject somewhat out of proportion, but more critically, they were seriously misleading and erroneous with regard to the meaning of structured programming.

The common misconception is that many business programmers and analysts think structured programming (a methodology) has something to do with how Cobol programs are written. We are misled to think that structured programming is a methodology intended to (1) avoid GOTOs, (2) create single entry/exit procedures, (3) decompose a program into small physical modules and (4) make programs clear and readable.

These attributes are actually the *effects* of using a structured method, not the method itself! The method is one which, when applied competently, yields a verifiably correct program that accurately models the problem and its environment. The attributes listed above are the natural by-products of the process.

Above all, the structured methodology answers the central program design question: What are the parts and how are they arranged? The arrangement must model the problem. The method also provides criteria for correctness to the answers that it supplies.

Since there are no evident criteria for verifying the correctness of Lim's and Sherman's programs, the mention of structured programming has erroneously entered their discussions. These gentlemen ahould have restricted their discussion to Cobol coding style only.

The need for proof of correctness is clearly illustrated in Sherman's program. It has a serious bug. The loop

(Continued on Page 26)

```
REFORMAT-THE-TRANS SECTION.
 OPEN INPUT TRANS-FILE.
 PERFORM READ-TRANS.
 PERFORM  REFORMAT-PROCESS  UNTIL  TRANS-KEY  EQUAL
HIGH-VALUES.
 CLOSE TRANS-FILE.
 GO TO REFORMAT-EXIT.
REFORMAT-PROCESS.
 MOVE TRANS-KEY TO SORT-KEY.
 MOVE TRANS-DATA TO SORT-DATA.
 RELEASE SORT-RECORD.
 PERFORM READ-TRANS.
READ-TRANS.
 READ TRANS-FILE INTO TRANS-WK-RECORD;
  AT END, MOVE HIGH-VALUES TO TRANS-KEY.
REFORMAT-EXIT. EXIT.
```

```
READ-TRANS.
 READ TRANS-FILE INTO TRANS-WK-RECORD;
  AT END, MOVE HIGH-VALUES TO TRANS-KEY.
 IF TRANS-KEY NOT EQUAL TO HIGH-VALUES
 THEN IF NOT SALES-RECORD
  THEN GO TO READ-TRANS.
```

Lim's Code

```
REFORMAT-THE-TRANS.
 OPEN INPUT TRANSFILE.
 PERFORM REFORMAT-PROCESS
 UNTIL TRANS-KEY EQUAL HIGH-VALUES.
 CLOSE TRANSFILE.
REFORMAT-PROCESS.
 PERFORM READ-TRANS.
 IF TRANS-KEY NOT EQUAL HIGH-VALUES
  THEN MOVE TRANS-KEY TO SORT-KEY
  MOVE TRANS-DATA TO SORT-DATA
  RELEASE SORT-RECORD.
READ-TRANS.
 READ TRANS-FILE INTO TRANS-WK-RECORD;
 AT END, MOVE HIGH-VALUES TO TRANS-KEY.
```

```
READ-TRANS.
 PERFORM READ-TRANS-2
 UNTIL TRANS-KEY EQUAL HIGH-VALUES
 OR SALES-RECORD.
READ-TRANS-2.
 READ TRANS-FILE INTO TRANS-WK-RECORD;
 AT END, MOVE HIGH-VALUES TO TRANS-KEY.
```

Sherman'a Code

HUMAN CONNECTION/Jack Stone

Unique Methods Thwart Program Espionage

From an article in the *Washington Star* [Oct. 5] titled "FBI Eyeing Soviet Spy Case in Virginia":

"The FBI is investigating a case of alleged Soviet espionage involving a Reston computer firm . . .

"The case involves a Western European businessman who was denied further government contracts with the Soviets unless he agreed to obtain computer technology information from American firms . . .

"The European businessman is a 'Soviet agent' who approached . . . an employee last week and attempted to bribe him in an effort to obtain a highly sophisticated program source code [sic] . . ."

The time: 8 p.m., Thanksgiving Eve.

The place: The Omelette Room of Clyde's, a popular Georgetown watering hole. The place, as usual, is jumping with a horde of regulars wandering around looking for amusement. Rock music is blasting forth.

The situation: Heinrich Feldspar, a prominent Western European businessman, is sitting at one of the tables in the corner scanning through a program listing. Every so often, he refers to a narrative write-up on his left. He squints, apparently having some difficulty reading by candlelight, and then shaking his head as though he doesn't quite understand the meaning of the code.

Enter Shadrach Bindago, superprogrammer.

"Hi there, Mr. Feldspar. How'ya doing? Any questions?"

"Ah, Mr. Bindago, thank you for coming. Such a clever place to meet. Who would ever suspect we were playing 'games'?"

"Mr. Feldspar, I know. Say I brought my micro-programmed backgammon system. Want to give it a whirl?"

"Well, thank you, not at the moment. Why don't we get right to the issue at hand. I'm interested in purchasing this program because you have the reputation of being one of the finest programmers in the U.S. and employ only the latest, most efficient coding techniques."

"In all humility, Mr. Feldspar, that's correct."

"Now, it was my understanding that this program was going to be written in the Structured Assembly Language Coding (ALC) methodology, but I see a number of GOTO statements embedded in the program."

"Of course. I write in the Bindago dialect of Structured ALC which, beyond a doubt, is far superior to the plain ol' vanilla variety. If you look carefully, you will see I have incorporated many other improvements. My code usually runs from 2% to 4.5% faster than the old techniques."

"But, Mr. Bindago, your program will be exported behind the Iron Curtain and communications with you to resolve programming problems will be very difficult, if not impossible."

"Now, Mr. Feldspar, you wouldn't want to deprive the programmers over there from the challenge of trying to track my code. Surely, that's one of the few joys they are allowed in their society."

"Speaking of tracking code, Mr. Bindago, I can't seem to follow the program logic from the narrative. Are they both at the same level?"

"Exactly, except that certain flowcharts are somewhat out of date. And then I was too busy to finish the write-ups on Sections 9 and 10. Oh, yes, I have to add certain interface sections. But don't worry, ALC is practically self-documenting if one adds the comments, and your programmers will be able to follow things all right directly from them.

"I intend to add the comments just as soon as I finish my next program. Besides, documentation is such a bore. You'd rather have me writing code, now wouldn't you?"

"Of course. It'a just that I'm wondering if the maintenance programmers who get the responsibility for this program will be able to handle it. I guess that as long as the assemblers are the same, a lot of the problems will resolve themselves."

"There you have it, Mr. Feldspar. Thank goodness we Americans have universality in our system software. Now, this program was assembled on Version 7, with these assembly program corrections applied." He hands Mr. Feldspar a five-page listing of program corrections.

"But Mr. Bindago, I recently purchased the assembler program Version 4. Will there be a problem in assembling the code?"

"Of course! What a truly magnificent challenge I am providing to your people. Just think of it — they will have to figure the assembler logic and make the corrections necessary to assemble and maintain my code. You are certainly 'getting far more than you bargained for!"

Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

READER COMMENTARY/ Edward J. Talbot

Sherman, Lim Coded Different Problems

Bruce Sherman's "Users Should Avoid All Cobol GOTOs" [CW, Nov. 5] presented a valid point, but his coding examples do not always illustrate the same problem Lim's code does.

In Figure 6, Lim's code checks for a maximum number of errors on the transaction being validated, while Sherman's example disregards this completely.

Another significant difference is in the implied code to actually execute these examples. Lim's code implies a consistent PERFORM PARAGRAPH-X through PARAGRAPH-X-EXIT. Sherman's code implies a PERFORM PARAGRAPH-X.

Figure 7, PROCESS-TRANSACTIONS, best illustrates this. In Sherman's code, there must be an implied return at the end of PROCESS-TRANSACTIONS. If it is not there, his logic would cause a fall-through to PROCESS-TC1 and so on; the implied return is created by using PERFORM PARAGRAPH NAME.

Inexperienced programmers who want to use Sherman's approach to code must understand the entire concept or they will create unforeseen program bugs.

When I had programming responsibility, my programmers were allowed to use GOTOs when branching downward to an EXIT paragraph or when no other readable code could be built. We also preferred to use PERFORM PARAGRAPH through PARAGRAPH-EXIT for readability in debugging and maintenance.

It seems that the issue should not be to avoid GOTOs at any cost, but rather to use GOTOs when they clearly enhance the structure, readability and maintainability of a program.

It has been my experience that judicious use of GOTOs does not create poor or mediocre code as Sherman suggested.

Talbot is distribution systems planning and research manager for Montgomery Ward in Chicago.

Articles Ignore Central Issue

(Continued from Page 25)

"PERFORM REFORMAT-PROCESS UNTIL TRANS-KEY EQUAL HIGH-VALUES" has not been initialized (see figure). This is a fundamental requirement for all loops. If, in his program, the field TRANS-KEY initially contains high values by chance, the program will fail.

Lim's program, by contrast, does initialize the loop with an initial read that establishes the value of TRANS-KEY.

More Serious Error

There is a more serious error in the construction of both programs. The authors agree that a modification to the program to select certain records (say, sales records) should be accomplished by replacing the READ-TRANS paragraph with the one noted below each of their respective programs.

Consider such a modification. Now, neither program accurately models the problem. The new problem can be simply stated as follows: Select sales records from the transaction file and release them to the sort. Ignore all other records.

The problem clearly specifies a selection process; that is, records are *conditionally* released to the sort. Lim's program component, REFORMAT-PROCESS, is *not* conditional. It implies all records are released to the sort. The main body of the program does not model the real problem. It is not until further inspection into READ-TRANS that we see the subtle "trick" of selection.

Sherman's code is just as obscure and misleading as well. The release to sort instruction *is* conditional but under the wrong condition — not the one specified by the problem. The specified condition of selection is again buried in READ-TRANS.

Proper Model

A proper modeling of the problem as dictated by the structured methodology (not defined here) would yield the following program code:

```
REFORMAT-THE-TRANS.
 OPEN INPUT TRANSFILE
 PERFORM READ-TRANS
 PERFORM SELECT-SALES-RECORD
   UNTIL   TRANS-KEY   EQUAL   HIGH-
VALUES
 CLOSE TRANSFILE.
SELECT-SALES-RECORD.
 IF SALES-RECORD
   MOVE TRANS-KEY TO SORT-KEY
   MOVE TRANS-DATA TO SORT-DATA
   RELEASE SORT-RECORD.
 PERFORM READ-TRANS.
READ-TRANS.
 READ TRANSFILE INTO TRANS-WK-
     RECORD
   AT END MOVE HIGH-VALUES TO
     TRANS-KEY.
```

This solution is the result of applying the methodology which begins with an accurate model of the problem. The central repetitive process (SELECT-SALES-RECORD) is doing just that — selecting sales records.

Vignone is a DP consultant based in Vernon, Conn.

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READER COMMENTARY/Chris D. Rohrs

Some GOTOs Needed for Sake of Readability

Several years ago, I promised myself I would not get involved in the *sturm-und-drang* surrounding the GOTO-GOTOless programming question. I made this promise after an argument with a college instructor who stated that she flunked students who put GOTOs into their PL/I or Cobol programs.

My time is too short to dispute with the fanatical followers of Dijkstra or Yourdon. However, Bruce Sherman's dogmatic attack on the limited use of GOTOs in Cobol programs [CW, Nov. 5] raised some points that need to be questioned.

Sherman stated, unreservedly, that programs with GOTOs are less readable, less understandable and less maintainable. I will attempt to show that the total abolition of all GOTOs, regardless of their usage, can make programs that are less maintainable, understandable and/or readable. Lest I be accused of heresy, I will admit up front that unrestricted use of GOTOs will make for "spaghetti bowls" of code and should be avoided.

Sherman gave an example of clear, readable, maintainable code: "PERFORM VALIDATE-DATA-2 VARYING ERR-INDEX FROM 1 BY 1 UNTIL ERR-INDEX GREATER THAN ERR-INDEX-LIMIT OR ERROR-CNT NOT LESS ERROR-CNT-LIMIT."

To create his "clear, readable, maintainable" code, Sherman has introduced a subscript and two error counters of some type that must be maintained. Unless the author of this code is fairly astute, the odds are good that these three variables will be scattered through working storage rather than grouped together.

With regard to the line of code itself, Sherman replaced a simple GOTO statement (three words) with a complex PERFORM statement containing 18 words. Is this an "easily understood" statement?

I had to read that particular PERFORM statement several times to try to discover under what conditions VALIDATE-DATA-2 is being performed and how processing will fall out of that paragraph. Several other programmers I showed this to had similar difficulties. Sherman created a complex statement where a simple one would have sufficed.

In another example of replacing simple code with a complex statement, Sherman replaced a GOTO . . . . . DEPENDING with "IF TRANS-CODE = 1 THEN PERFORM PROCESS-TC1 ELSE IF TRANS-CODE = 2 THEN PERFORM PROCESS-TC2 ELSE IF TRANS-CODE = 3 PERFORM PROCESS-TC3 ELSE PERFORM PROCESS-TC-ERROR."

This complex little statement actually has two problems. First, it is a series of IF . . . . ELSE statements. In only testing three conditions, it can be grasped by the mind fairly easily. But if it is continued to allow for, say, 10 or 15 possible values of TRANS-CODE, a statement like this can quickly become a monster requiring decision tables to decipher.

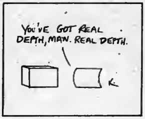
Second, Sherman's IF . . . . ELSE statement was immediately followed by paragraph PROCESS-TC1. Under the rules of Cobol PERFORMs, when the PERFORM statement completes processing, it proceeds with the next sequential instruction. Unless there are intervening statements following "ELSE PERFORM PROCESS-TC-ERROR," control will pass to PROCESS-TC1 regardless of the value of TRANS-CODE. Worse, PROCESS-TC1 will not be a performed paragraph, but instead processing will simply "fall through."

Sherman could argue that there is, in fact, intervening code to branch around PROCESS-TC1 and so forth. Could some of that intervening code contain, dare I say it, a GOTO?

It could also be argued that the paragraph containing the nested IF statement was, itself, performed. Let's assume that that paragraph (PROCESS-TRANSACTIONS) is performed from elsewhere. A programmer trying to debug PROCESS-TC1 will have to work backwards to PROCESS-TRANSACTION to find out why PROCESS-TC1 is being performed, then work backwards from that to another area of code and so forth.

This series of backward steps can be very difficult, especially if the programmer is working with a paragraph that is performed from several places in the program.

The lack of some way to branch around sections of code can make for this type of backtracking or can make for complex nested IF statements.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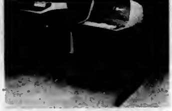

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THE TAYLOR REPORT/Alan Taylor

System Design Virtues Can Look Like Cover-Ups

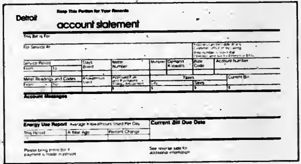
Some of the most encouraging letters sent to me are about system designs that have gained the approval of other professionals. Examples of these designs are sent in to show me that, as one recent correspondent put it, "some people are listening."

Normally, these do not get published, for in a column like this, the major lessons in systems design are best drawn from bad examples, rather than good ones. However, in one case there is a good reason for publishing the item. It exemplifies another facet of the problem I discussed last week: poor field selection leading to a great deal of public frustration. This time, however, temporarily accurate data is used in the output fields, rather than simply in the record fields.

Detroit Edison has recently prepared a new billing form with a number of praiseworthy features. It provides a comparison of the customer's current energy use with his use a year earlier and gives a clear explanation of the amount due (See figure). The design is clear and includes a phone number for customer inquiries.

The bill identifies the source of the meter reading (actual, estimated or supplied by postcard) and delineates the charge period with both first and last dates.

On the whole, this is an excellent design which shows that Detroit Edison is careful and knowledgeable.



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Taxes City Sales
Current Bill
Account Messages
Energy Use Report Average Kilowatthours Used Per Day
This Period
A Year Ago
Percent Change
Current Bill Due Date
Please bring entire bill if payment is made in person
See reverse side for additional information

Detroit Edison's New Bill

Vital Date Missing

However, there happens to be one date missing — the statement mailing date or some equivalent. We know that date is not the same as the end of the billing period, because after the billing period, time is allowed for a householder to receive, fill in and submit a postcard with his reading. In addition, time must be allowed for Detroit Edison to send out the bills.

This missing piece of information becomes important when it is noted that there is no basis given for the "current bill due date." The missing date will come into play only if there is a dispute about whether the bill was sent out in time to allow payment before the claimed due date. In this case, where the date of receipt is normally assumed to be three days after an actually known date — the date of the bill itself, or its mailing date — the planned lack of any information as to when it was sent out will appear to be deliberate because of the evident design skill of Detroit Edison. And the other positive features will be regarded as mere cover-up designed to make the lack of bill dating less obvious in a preliminary review.

But worse than that, the more closely one examines the design, the more apparent it becomes that the customer will be unable to keep billing or payment dates straight. The receipt or posting dates of his previous payments are not shown, so he cannot know how long Detroit Edison takes to process his payment or have any clue as to how long the Post Office takes to send material to Detroit Edison.

The balance forward from earlier cycles is printed in the "account messages" section, which again precludes the customer from being able to determine processing or mailing times. And the inquiry facility cannot be expected to be trusted after a dispute has arisen.

In evaluating a system, its ability to defend itself when disputes arise is at least as important as the provision of useful but optional ideas. In practice, the Detroit system can be put right, without changing the field designs, by printing out the processing and estimated mailing dates in the "account messages" section. But that is a band-aid where a field design flaw is being covered over by operational patching.

This is not a good alternative to checking that only permanently correct data is used in the system. The "current due date" will be correct *only* if processing and mailing is completed some specific time before the date given, the amount of time needed being some contract term or regulation.

When a system uses data that does not take this into account, or fails to provide data that can confirm the terms have not been breached, it is using only temporarily accurate information and is therefore error-prone.

Detroit Edison should alter the design while the sysem is still new.

For the rest of us, the lesson of Detroit is that if the basic function has holes, the decorations on top look like the tools of a conman rather than the works of art they probably are.

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End Users Key Factor

Problems, Promises to Intensify in '80s

By Don Leavitt
CW Staff

TULSA, Okla. — "'People problems' are at the top of my list of issues for the 1980s, just as they're at the top of everyone's list; but beyond the basic issues, I also see that new technology offers both promises and threats to us in the decade ahead," Dennis L. Fletcher said here recently.

Speaking to one of the sessions at the Southwest Software Conference [SWSC], Fletcher said the shortage of good people ran all the way from those with doctoral degrees in computer science to operators. For example, he noted that the technical school with which he is affiliated in Los Angeles "has no problem at all" in placing people as they graduate.

A product line manager at Informatics, Inc., Fletcher said he also sees data base growth as another key issue of the '80s, along with the problem of developing adequate application software and providing the end user with good access to information.

Happily, each of those four problem areas is being addressed with growing understanding by DP and upper management, as well as the commercial software vendors, Fletcher continued. Effective human energy management — more effective use of the people that are available — is coping with that problem in some shops.

CW At SWSC

Data base management systems were certainly acquired by many installations during the '70s. Only now are many of those purchasers beginning to realize any significant benefit from their investments, Fletcher said.

Although he was among the conference speakers who cited the very small percentage of the average DP budget that goes to purchased software, the Informatics spokesman noted that users are beginning to find a choice of tools to help them get applications up and operational much more quickly than before.

The availability of both higher level languages designed to support particular end-user departments and more effective applications packages provides the users with a new form of the classic make-or-buy decision. Either choice gets things moving more quickly than in-house development with conventional programming tools, he noted.

But it is the end users themselves who are going to become a real driving force in the next 10 years, Fletcher predicted. People out in the non-DP departments are really taking hold of the report writers and query language capabilities that are now available, because they want — "they have to have" — access to their data.

As a matter of fact, the report writers and query languages appear to be merging, he said, explaining that the users like the speed of the query facilities and the formatting facilities of the report systems.

While he seemed to have a positive comment for almost each of

(Continued on Page 30)

Tests Match Pascal Compilers Against Proposed Standards

EASTON, Pa. — Users working with or developing compilers for the Pascal language can now determine how well their compilers comply with the standardization efforts being mounted here in the U.S. and internationally.

Available from the American Newspaper Publishers Research Institute (ANP/RI), the Pascal Validation Suite (PVS) consists of 319 test programs, amounting to about 11,000 lines of Pascal code. The programs were designed to test compilers for their compliance with the draft document describing Pascal proposed by the British Standards Institute and the International Standards Organization (ISO).

That document — which follows the developmental work originally done by Niklaus Wirth — is also being used in the U.S. standardization work being run jointly by the American National Standards Institute and the Institute of Electronics and Electrical Engineers.

Stringent Tests

The PVS programs systematically exercise a Pascal compiler, and the tests are so stringent that the typical commercially marketed Pascal compiler fails between 50 and 80 of them, according to Richard Cichelli of ANP/RI, who is managing the distribution of the validation suite in this country.

Although the specific tests are "obviously" different, PVS is similar in basic purpose to the validation tests produced for Cobol compilers by the government's Cobol Compiler Testing Service, Cichelli noted.

More than 25 mainframe and software vendors have ordered the Pascal validation tests since they were first released in the U.S. three months ago.

Developed by Arthur Sale and Roy Freak of the University of Tasmania, PVS source code is being distributed on 9-track, 800 bit/in. magnetic tape, in Ascii or Ebcdic character sets. Special formats for Digital Equipment Corp. environments are also available.

The software costs $50, which must be paid in advance. Requests for the routines or for more information should be addressed to Cichelli at ANP/RI, P.O. Box 598, Easton, Pa. 18042.

System/34 Gains RPG-II Support

ATLANTA — An interactive Basic compiler for IBM's System/34 will be available in January, according to a spokesman for the company's General Systems Division.

In addition to widening the options available to System/34 shops developing programs in-house, this would appear to enable users to consider the myriad of programs that have been written in Basic for other equipment.

IBM did not indicate what — if any — limitations or extensions the System/34 Basic has compared with other implementations of Basic, but adaptions from one environment to another are often quite simple, an observer noted.

Line Syntax Checked

In use, the IBM compiler will check the syntax of each line of Basic as it is entered. If an error occurs, the programmer/user can correct it and continue or press a "Help" key, at which time the system will display the correct syntax and an explanation of the Basic statement being entered.

While the interactive approach speeds the development process, the system's ability to retain compiled statements in main memory — assuming sufficient space is available — speeds program execution, the spokesman said.

Other features built into System/34 Basic, and into the equipment itself, allow the user to stop execution of the program, examine or change variables and resume execution; to display screen formats; or to work with a screen-scrolling function for full-screen or line-at-a-time paging, he reported.

The Basic support requires a System/34 with at least 48K bytes of memory. The package costs $40/mo, the spokesman noted from P.O. Box C-1645, Atlanta, Ga. 30301.

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DP Management Seen Facing 'People Problems'

By Don Leavitt
CW Staff

TULSA, Okla. — "The computer is a wonderful tool. We've learned a lot about managing it and managing our own expectations. But there are still times we make mistakes."

That was the essence of the message brought to the Southwest Software Conference (SWSC] here last week by Herb Beattie, manager of information services at the Williams Companies.

People are the biggest problem, from the overeager hardware salesman, to the overconfident programming staff, to the overly demanding upper management. But, Beattie added, with proper management all problems are solvable.

"Our job is to work toward improving the corporation's bottom line. Justifying systems is not our job," he told his audience. "We have to determine, as accurately as we can, the costs of possible alternatives. Our job is to help upper management make good decisions, not to make the decisions for them."

CW At SWSC

To that end, he added, DPers have to curb their overoptimistic view of the time and effort needed to get a job done. "Certainly we suffer from a credibility gap now, as you know."

The technical staff has to develop its estimating capabilities so proposals made to upper management can be taken at face value. "Certainly management doesn't care about problems we encounter trying to live up to unrealistic estimates."

"On the other hand," Beattie continued, "we can't accept an 'I don't know anything about data processing' attitude from top management. Almost anyone going through college or coming up through the ranks of organizational management has been exposed to computers and has a sense of what they can do."

Upper management's relative familiarity with computers is no excuse for DPers to stick doggedly to their special jargon when talking to their superiors, he continued. "If we can't explain something in good plain English, maybe the problem doesn't exist, or we don't really know what the solution is."

Concern about the cost of providing service shouldn't impact the level of service to be provided. He noted that

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Hopes, Problems To Mount in '80s

(Continued from Page 29)

the issues he raised, Fletcher had a less than optimistic view of the typical DP installation's current situation. The backlog of new applications is growing, with a "waterfall effect" as users see the benefits of things that are moved to the computer. But the growth of the application libraries also adds to the backlog of maintenance work.

The "growing volume" of user inquiries will have to be dealt with, but that won't be easy with the inadequate tools and techniques that are in such heavy use today. Fletcher also noted that only 25% of data base-inclined shops have two or more applications under the systems.

With the upward-spiraling of personnel — and training — costs, installations are once again finding staff retention is a real problem, he said, adding that vendors and users are affected equally in this regard.

New Technology

On a more upbeat thought, Fletcher said all the new technology now emerging offers considerable promise for the '80s. Certainly cheaper computing power is a fact of life, but, he warned, peripherals still cost a lot of money.

Data base management systems really will lead to implementation of the integrated management information systems that have been the dream of DPers and end users alike since the mid-1960s. DBMS provides the flexibility that is needed but was never available in the file-oriented systems of the past.

Users have far better currency of information — "which is what they must have, to run any business" — with the continual expansion of data communications facilities, and he noted that information is staying where it is needed or being moved easily to that point through the implementation of distributed data processing operations.

Threats inherent in DP operations of the '80s are perhaps just as important as the promises of the new technology, Fletcher said. Application systems and individual programs are increasingly complex, and that impacts programmer productivity in both development and maintenance activities.

As users become more familiar with DP, they gain in their understanding of what the systems can and cannot do. That will tend to shorten the useful life span of many application programs, since users are asking for more modifications to meet their real needs.

Those user requests are also reflected in the "explosive growth" of user information demands through the report writers and query languages prevalent, he said.

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RPG-II Program Development Eased

ORONO, Maine — The Source Storage and Retrieval System (SSRS) for System/34 RPG-II users is available from Futurenow Software Co.

SSRS is a menu-driven utility designed to aid program development by allowing the user to store, modify and selectively extract commonly used segments of RPG-II code, the vendor said.

SSRS can maintain several source data files that are capable of holding whole programs or program segments. The holdings can be merged into the user's programs via simple commands, the vendor claimed.

The package can be used to store commonly used input file specifications and calculation subroutines. Program code modifications can also be batched to market the changes to multiple programs.

The SSRS package with documentation and source diskette costs $150. Several RPG-II subroutines — name reversal, numerical dollar to English conversion and binary searches on sequential data files — are also available.

The subroutines cost $30 each, the vendor said from P.O. Box 354, Orono, Maine 04473.

'People Problems' Seen Facing DP Managers

(Continued from Page 30)

his data center has, in effect, a contract with the Williams units it supports, thereby guaranteeing the amount of service to be given.

Beattie said he saw no reason to keep the costs of the service hidden from the users and added that at Williams all costs are charged to and paid by the users. The cost of overruns has to be swallowed by the DP operation, but "underruns" result in fees returned to the user.

Pressed to provide specific examples of how well that policy actually works at his installation, Beattie said he has a budget of between $3 million and $3.5 million, but right now he is faced with a $250,000 cost overrun on one particular project.

This "serious technical bust" involves an attempt to use Data General Corp. minicomputers. During the development cycle, the staff had weekly meetings and all reports were good. Each program was designed and written on time and each worked well during its initial tests.

But once they were brought together, the four tasks that had to work concurrently in the proposed applications "just wouldn't work."

The problem, he explained, was that the technical staff at the data center had gotten used to having all the memory they could possibly want because they had an Amdahl Corp. mainframe running under MVS. In contrast to that, the DG minis have "very, very fixed" memory sizes.

Memory management was a thing they just had never learned; they didn't have to with the Amdahl/VS environment. But the four tasks that had to work together just wouldn't fit in the DG settings, and the staff had not thought to check for that possibility as they created and tested the programs.

System/3 Users Get Subroutine

RESEDA, Calif. — Users of the IBM System/3 Model 15D can get a subroutine that attaches to IBM's Line Source Library Maintenance System to reportedly cut run time by 30 sec to 1 min on each compilation.

Hawkeye Information Systems Inc., is offering the subroutine as part of a promotional program to identify 15D users. The software is available only for installed System/3 Model 15D CPUs.

By using the subroutine, users can compile RPG-II programs directly out of the IBM SOURCE file, saving time and library space. Without the subroutine, users must copy programs into the source library before compiling, Hawkeye said.

Documentation and installation instructions are included in the package.

The subroutine comes only on diskette and is available for a $10 handling charge from the vendor at P.O. Box 1194, Reseda, Calif. 91335.

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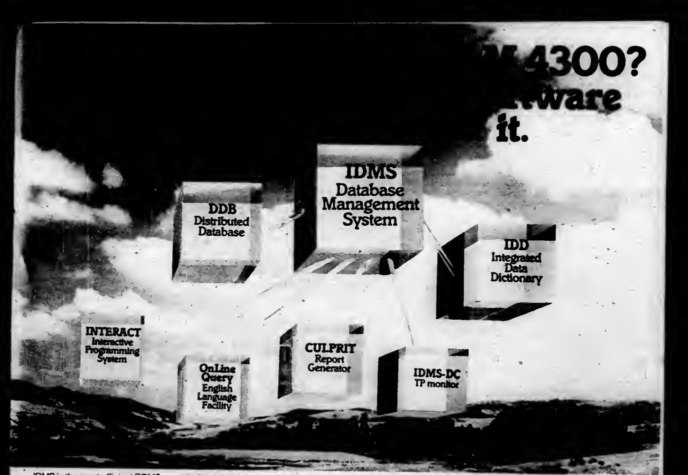

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IDMS-DC is the only data communications system designed specifically for use in the database environment. Fully integrated with IDMS, IDMS-DC therefore gives faster response time, more economical use of memory and greater simplicity of use than any other TP monitor can in a sophisticated multi-terminal configuration. IDMS-DC provides a powerful recovery facility, mapping support, storage protection and many more programmer productivity and data integrity features.

Data Dictionary
IDD is the only "active" data dictionary because it is fully integrated with a database system. It is a powerful design and control tool for use with IDMS and with the other Cullinane software components, yet it can be used as a stand-alone system to define and standardize *all* data resources whether manual or automated, database or conventional file systems. IDD supports FORTRAN, COBOL, PL/1 and Assembler.

Report Generator
CULPRIT can be used to produce even the most complex reports quickly, easily and with a bare minimum of coding. It can access virtually any file structure including conventional files or databases. CULPRIT is economical. It can produce up to 100 reports with a single pass. CULPRIT can be used as a powerful stand-alone or as part of a fully integrated system.

OnLine Query
OnLine Query, Release 2.0, is a major new advance in interactive information retrieval systems. Fully integrated with IDMS, it requires no programming to be immediately useful upon installation. OnLine Query provides managers and user departments with a powerful, easy-to-use set of English commands that allow instant access to selected information stored in the database. Multiple Record Retrieval, QFILE storage and DBKEYLIST command are only a few of the system's advanced features.

OnLine Program Development
INTERACT is an online system for program development, remote job processing, text editing and word processing. INTERACT is *the* programmer productivity system. It offers a powerful command repertoire, fast terminal response time, and economical CPU requirements.

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Coast-to-Coast Applications

DBMS 'Earns Its Wings' With Pilots Union

By Clifford A. Johnson
Special to CW

In New York City, representatives of a major airline and representatives of the pilots and co-pilots who fly its fleet of aircraft sit down at opposite sides of a table to begin bargaining over a new two-year contract.

In Colorado, investigators descend upon a remote mountaintop to find out why an airplane dropped below its designated flight path and plowed into the rocky terrain.

In Washington, D.C., dues and other information about members of a professional association are fed into the data base of a computer system.

These disparate functions suggest some of the ways the Air Line Pilots Association (Alpa) has been using a data base management system (DBMS) since 1975.

James E. Barnett, director of information systems for Alpa, realized in 1974 that the organization needed a DBMS. At the time, the association's DP facility used conventional file methods that had many inefficiencies, lacked needed capabilities and were expensive in terms of programmer productivity. Alpa's requirements were outpacing the ability of its then current five-year plan to help manage the data compiled and used by the organization, Barnett explained.

As the union for about 30,000 pilots with most major U.S. airlines, Alpa offers a variety of member services that necessitate a sizeable — and growing — compilation of information. A major activity for DP services is statistical research in support of association objectives. In addition, the association uses its computer in air safety studies, engineering and management of membership dues and other records. Alpa's national office staff is housed in the association's own building in Washington, D.C.

When the decision was made to acquire a DBMS, Barnett and several other members of the DP department conducted a study of available products. The goal at that time was to obtain a system that would fit into our diversified environment and remain current for a five- or 10-year period.

Comparison of Cullinane Corp.'s DBMS offering, IDMS, with those of competitive firms showed IDMS had a lot of what we wanted even at that time: recovery facilities, networking, good utilities. The transformation to IDMS was made in 1975, and experience since then has reinforced our preliminary evaluation: IDMS has been the software cornerstone that has enabled us to provide the high quality but variable services our members require.

In addition to the basic IDMS, we have also acquired the central version — which allows several users to work with a single copy of the software and the on-line query support feature.

Designer's Tool

IDMS is a designer's tool, not a designer's nightmare. It has flexibility, yet it does not offer so much of a choice that designers become confused. It does not force them into any single line of thinking, like an inverted system.

The following is a checklist of benefits I have realized in my six years of experience with IDMS:

- Service is good and has improved over the years.
- Documentation is excellent, although there is about a three-month lag in updating the documentation from an old release to a new release.
- Constant improvements offer an evolving product. It has not stagnated at all, to say the least. We have just implemented Release 5.0 in which the internals were rewritten to make the system more powerful in processing large amounts of data.
- System maintenance is possible with a minimum of personnel. I have been able to take care of this function myself, although at present I have assistance because I handle other assignments for the association.

Alpa recently converted from an IBM

(Continued on Page 36)

DOS/VS CICS Terminal Printing

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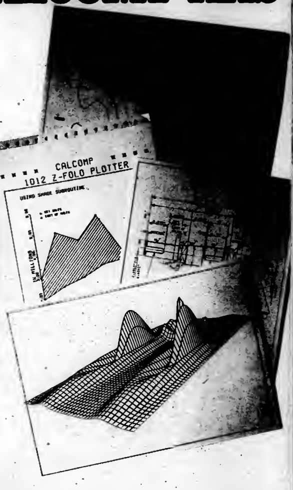

RPG-II Enhances 'Super-3' for System/3

SANTA ANA, Calif. — Memorex Corp.'s Business Systems Division recently added an RPG-II capability to its Super-3 on-line display package for IBM/3 Models 8, 10 and 12.

Super-3 offers most of the capabilities of IBM's Communications Control Program (CCP), but costs less, a spokesman claimed. Without getting into more detail, he noted that "complex operations requiring a highly trained user" were the types of things not covered by Super-3.

The basic package performs all the functions needed to convert a batch-oriented, card-based system into an on-line operation, he said.

Since many System/3 users normally work with RPG-II as their primary programming vehicle, having the language available for Super-3-based operations makes the Memorex package more useful than it would be if users had to learn a new language, an observer noted.

With the addition of RPG-II, users can validate information entered by a terminal operator and inhibit processing if the information is invalid; perform calculations for display or to a given data file; accumulate totals; or pass information from one data record to another.

The enhancement also enables users to translate and validate coded information within a data record; inhibit data record update to one file — thus permitting a review of transaction data from the current period before it is posted to the permanent record; or display RPG-generated messages.

RPG-II can be used to restrict specific Super-3 programs to individual terminals, according to Memorex.

The RPG-II enhancement to Super-3 costs $1,500. It rents for $75/mo. and leases for between $40 and $60/mo, depending on the term of the contract.

Super-3 itself costs between $8,100 and $8,500, depending on user's System/3 model and configurations.

The RPG-II enhancement is preinstalled on new Super-3 orders, the vendor said from 3015 Daimler St., Santa Ana, Calif. 92705.

Sycor 445, IBM CPUs Tied

NEW YORK — The Batch Communications Program (BCP) from Computer Dynamics, Inc. (CDI) now supports transmissions between Sycor, Inc. 445 remote systems, as well as other Sycor units, and IBM mainframes — with more capabilities than Sycor itself provides, according to a CDI spokesman.

Residing in the IBM host and running under DOS, OS or VS environments, BCP permits two-way communications with one telephone call. Sycor software normally requires a separate call for each direction, he noted.

Organized as a Btam task providing bisynchronous protocol, BCP offers backing for six lines to or from the mainframe. An auto-dial feature built into BCP simplifies such tasks as data collection from remote sites over dial-up lines in the evenings, the spokesman reported.

The communications program continues to work with Sycor 340, 350 and 440 CPUs — as well as the newly added 445 — as units out in the field, and with IBM 360, 370, 30 series and 4300 CPUs as hosts, the vendor said.

BCP costs $8,000 and is available from CDI at 10 E. 39 St., New York, N.Y. 10016.

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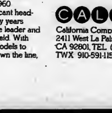

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Sort Routines Run on Micros

NORWALK, Conn. — Five sort routines, written in Basic and adapted from logic used in mainframes, have been adapted for Radio Shack's TRS-80, Apple Computers, Inc. Apple and Commodore Business Systems, Inc.'s Pet microprocessors by Creative Computer Consultants, Inc.

A publication called Volume 4, *Sortmaster*, lists five Basic subroutines designed to sort numeric data in memory. The sorts, used routinely in large mainframes dealing in a high volume of sorting, can be integrated into the user's main-line programs.

Any numeric field may be sorted by designating it as a sorting key. This allows users to sort records of any length, the vendor claimed.

Multiple sorting keys can be established, and the sorts can be adaped to handle alphanumeric data

In addition to the five sorts, *Sortmaster* provides an introduction to sorting techniques. The book costs $8.95; the vendor said from 1 Quarry Lane, Norwalk, Conn. 06851.

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Work at Pilots Union Takes Off With DBMS

(Continued from Page 34)

370/135 to a Magnuson Systems Corp. M80 and found the software was completely transportable. At present, the association has 16 in-house terminals. It maintains a data base of about 150 million characters and 98 record types, with approximately 150 set relationships in the data base. The major thrust of the data consists of general airline information, historical trend data, engineering and air safety modeling capabilities and association financial and membership data.

IDMS has also proved beneficial to Alpa in the relatively new application of flight recorder readout analysis in aircraft accident-investigation. This enables users to obtain profiles from flight recorder data, then to vary a number of parameters — such as wind velocity and direction and other correction factors — into the data base. In this way, the engineers can examine aircraft flight paths under a number of varying conditions. The benefit of this function becomes evident when one realizes the effect wind shear may have on an aircraft flight path in rapidly changing conditions.

Within the next few months our membership/financial system will also be well served by IDMS. In the latest release of IDMS — 5.0 — the COMMIT verb allows batch updates to run concurrently with other batch or online updates using the same area(s).

The previous release, IDMS 4.5, did not allow such concurrent processing. This was primarily caused by the update application using the data base in the "protected update" mode for the duration of the update process, which was a necessity to insure data base recovery and integrity if an application abended.

Updates Blocked

A key disadvantage of this was that long-running batch jobs could lock out other on-line or batch jobs from updating an area for many hours. Therefore, data base batch processing usually had to be scheduled for the second shift or after data base on-line processing.

As additional systems became operational, more batch processing would have been competing for less available time during the first and second shifts. If we were still using IDMS 4.5, we probably would have had to institute a third shift to handle the volume. This potential problem has been averted with IDMS 5.0.

Johnson is supervisor of Alpa International's Information Services Department in Washington, D.C.

DBMS Design Topic of Courses

NEW YORK — A three-day seminar entitled "Data Base Design 80" will be presented in Boston early next month and in Los Angeles in mid-December by AMR International, Inc.

Separated into seven segments, the course will start with introductory data base concepts and then move into a discussion of national standardization and data base systems before tackling packaged data base management systems (DBMS).

The second part of the seminar will consider advanced data base concepts, the implementation of data base systems and how management views the corporate data base. It will end with some case studies of successful data base systems, according to course director George Schussel, a vice-president of American Mutual Insurance Companies.

The seminar will be held Dec. 3-5 at the Copley Plaza Hotel in Boston and Dec. 12-14 at the century Plaza Hotel in Los Angeles.

Individual registrations cost $525 but a group rate for two or more people from the same organization is $475/person, according to a spokesman for the Institute for Science and Public Affairs, which is administering the operation. The institute is at 1370 Ave. of the Americas, New York, N.Y. 10019.

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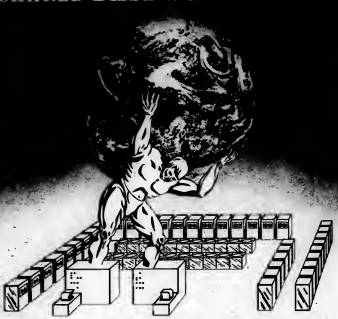

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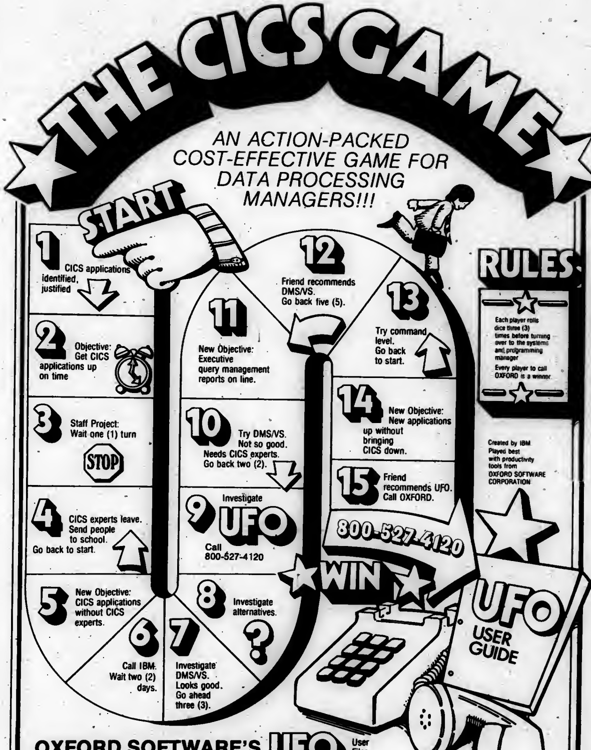

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Losing Sleep?

Report Covers Dark Side of Networking

By Brad Schultz
CW Staff

Let us consider the dark side of data communications networks.

They don't always work, do they? Recent product releases and a host of a new literature reflect growing user sensitivity to three areas of network performance letdowns: reliability, integrity and security.

Those aspects are addressed by the Special Report in this issue. The report brings together a diverse pool of expertise in matters that cut the sack time of too many communications managers nowadays. Hence the title: "Losing Sleep Over Networks."

Eye Opener

But the report shouldn't put you to sleep if you value one of the most comprehensive, while concise, tutorials on "internal network controls" yet to appear in the public press (see SR/7). Jerry FitzGerald's "Data Communications Control Matrix" is accompanied by his detailed recommendations on coping with almost any conceivable foul-up in remote processing.

The Special Report also features an assessment of what the user can expect from packet-switched networks in terms of reliability, integrity and security (see SR/2).

The same page kicks off Philip A. Tenkoff's missive on systematic reporting as a tool in monitoring network performance. And the page begins a look at how intelligent network processors (INP) bring big net functionality to small net users.

Spectron Corp. contributed the overview of remote access switching and patching (Rasp) on SR/14. The article traces the evolution to network management, a function whose primary objective is to minimize system downtime.

Called "the state of the art in network management," Rasp allows the user to perform a host of control tasks from a site well-removed from the network's main computer facility.

On SR/20, the reader will find an introduction to the basic concepts of data encryption with emphasis on the federal government's Data Encryption Standard (DES).

The emphasis is understandable since the article was written by some of the people who reportedly developed the DES algorithm, at IBM.

At odds with the IBMers is the flanking piece by Whitfield Diffie and Martin Hellman, who have consistently debunked the National Bureau of Standards and IBM claims for the DES since the algorithm was first proposed.

Analysis

On SR/4, a principal author of another federal security standard explains why real-time networks run more reliably than those in batch mode.

Elsewhere, the report also presents discussion of recent breakthroughs in reliability-oriented network products. Finally, a passel of user profiles rounds things out.

The profiled users report varying degrees of success with methods for maximizing system uptime; for ensuring that the data they send out is the data received; and for preventing unauthorized eavesdropping or tampering with transmissions.

Their experiences are summarized as a means of suggesting how you might improve your network's reliability, integrity and security. Without changing jobs, you might get a better night's sleep.

DEC Lab Systems, CPUs Linked

MARLBORO, Mass. — Digital Equipment Corp. has released software enabling its Minc or Mini-Minc laboratory computer systems to interact with DEC PDP-11 or VAX-11/78 processors distributed networks.

Called Minc Networks File Transfer (NFT), the optional package is said to be fully compatible with DEC's Decnet communications architecture. File transfers under Minc NFT can be local to remote, remote to local and remote to remote, a spokesman said.

The software also supports local system management tasks, including copying, deleting and displaying local files.

The package serves DEC systems running under the vendor's RSX-11, IAS and VAX/MVS operating systems, the spokesman continued.

Types of Links

Connections between a Decnet host computer and Minc or Mini-Minc systems can be made via direct cable, acoustic coupler or modem interface. The user reportedly can select transmission speeds and synchronous or asynchronous operation.

Minc NFT is available on a diskette storage medium that comes with various utility features, the spokesman said. The package has 20 commands separated into file commands for local file operations; calendar commands for data and time specification; and network commands for data transfer between systems.

The scientific software license costs $1,400. DEC's Laboratory Data Products Group has reportedly begun shipping the package from Marlboro, Mass. 01752.

Phasers Ready, Mr. Sulu?

Computer displays that will help the National Aeronautics and Space Administration (Nasa) plan the activities of space shuttle crew members before each flight undergo checkout at Nasa's Johnson Space Center in Houston. The Sanders Associates, Inc. Graphic 7 displays can depict spacecraft trajectory, daylight and darkness cycles and other data.

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Personnel Switch Lets Slave Printers Serve Bank

By Jay Woodruff
CW Staff

VISTA, Calif. — A bank here had to pressure its supplier of remote processing printers to change one of its support personnel before the devices could be made to function well.

But Southwestern Bank now finds that its Dataproducts Corp. slave printers are the only ones that meet the financial institution's requirements — in spite of the units' average failure rate of just under 15%.

The 15-branch bank, headquartered here in this San Diego suburb, took delivery on 20 Dataproducts T-80 printers almost a year ago to answer customer requests for a faster way to resolve discrepancies in their monthly statements, according to James Elliott, Southwest's project leader at its central accounting office.

The printers are installed primarily in the bank's northern San Diego County branches, with others in its southern Orange County and Riverside County locations. Before the bank acquired the printers, a bank patron waited three to seven days to get an interim statement that showed all transactions taking place since the last statement, at a charge of $5.

Under the old system, the bank would forward a request to its computer center, key it into the system, run it in batch and send it out to the customer by mail, Elliott said.

Southwest took its first step toward improving its statement service early in 1978, when tellers in all branches were put on-line over phone lines with accounts information residing in the bank's Burroughs Corp. B2800 mainframe.

Burroughs TT650 16-digit display terminals were installed at each station, while a pair of Burroughs TD834 CRT terminals were placed in each branch so bank officers could call up any transactiuns that tcok place since the customer's last statement.

In mid-1978, Southwest began to evaluate 23 printers to print the contents of the statement that officers could call up on the TD834. All but five printers were eliminated from competition because they were actually terminals, capable of interactive communications and requiring dedicated lines. Southwest wanted slave printers that could be easily adapted to run off the CRT.

The bank got its first surprise when it asked the five contenders to aid in evaluating the systems.

"Centronics [Data Products Corp.] just wanted to hook up a printer and try it out. The salespeople didn't know what they were doing," Elliott recalled.

Perkin Elmer Corp. sent a salesman who was not technically able to interface the printer to the CRT. Teletype Corp. was able to interface its printer properly with the Burroughs gear, but the system had to be rejected because it was too noisy for a bank office environment.

As for Texas Instruments, Inc., "I don't believe they returned my call," Elliott said.

This left the Dataproducts T-80, which looked like a good deal because the firm's engineering staff showed ready willingness to adapt it to the bank's requirements and because the printer was quieter and less expensive than its competition, he continued.

Dataproducts engineers modified the 5 by 7 dot-matrix system at its parallel interface board to work off the Burroughs CRT. Special cables were made up for connection to the terminal. Southwest was convinced and ordered 20 of them.

The systems can print a special interim statement at 30 char./sec for $2 instead of the $5 the bank had been charging previously. Statements can show up to 100 pages of detailed information from the CRT, including the date a check was cashed, dates when automatic transfers were made and all other activity during the period under review.

Sour Note.

The only sour note has been service for the systems. The problems started when Southwest, which had been dealing directly with Dataproducts, was told that the sale would be handled by the newly appointed regional distributor — Wyle Distribution Group of San Francisco.

All went well until Wyle informed the bank that each printer would cost $100 more than the bank was originally quoted, because of a communications mixup between Wyle and Dataproducts.

Wyle had quoted the bank its wholesale cost, not its retail price. Southwest, however, held firm, and it finally took delivery of the printers at the lower cost.

After delivery, the printers continually blew fuses — metric fuses for which the bank could not locate replacements — leaving most branches without printers. After attempting to resolve the problem through "an incompetent individual" at Wyle, "we called Dataproducts and raised hell," Elliott recalled.

The vendor sent a liaison engineer with a bag of fuses, and he was able to diagnose and repair the circuit problem that caused the blowouts. Since then, "things have settled down after Wyle replaced the individual who dropped the ball," the project leader reported.

In spite of the failure rate, which Elliott considered to be acceptable but higher than he would have expected, the bank still sees no substitute for the printers' quiet operation and price.

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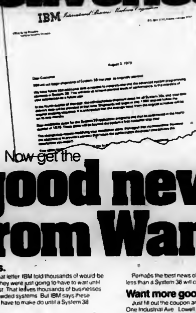
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Private Packet Net Configured for Large Users

By Marvin B. Heitt
Special to CW

In configuring a private packet network for large communications users, the physical distribution and location of all devices in relation to their functional roles is crucial to ensuring reliability and cost-efficiency.

The user's growth in communications requirements must be considered along with immediate needs in establishing the optimum configuration.

As one of the vendors addressed to large, geographically dispersed users, ASI Teleprocessing, Inc. offers a private packet network featuring a transparent, dynamically routed and reliable means of linking dispersed CPUs, terminals, applications and data bases to form an integrated system.

ASI's network supports synchronous, asynchronous and bit- and byte-level protocol devices and can handle terminal data (hard copy and video) and audio response messages interchangeably.

The network is sold to large industrial, financial and retailing institutions as a private data communications system. The network is modular and can be installed in a building-block fashion.

Its basic structure features an independent processor acting as an intelligent communication control system to interconnect processing centers, terminals and their respective software control system.

Typical Configuration

Typically, one element interfaced to the network contains a data base and primary application system and is thus identified as the network "host."

In this configuration, where there is one host and a multitude of lines and terminals, the nucleus acts as a front-end and assumes all communication responsibility. All messages are delivered between terminal and host using a simple addressing methodology.

The configuration features support of all major mainframe manufacturers' standard operating systems. For example, for IBM users, the network can be supported under Vtam in a Systems Network Architecture (SNA) environment. Alternatively, the network can be used in lieu of SNA..

Nodal System

The network's unique features have been used to their fullest extent in a system the Bank of New York installed in 1976. Nine ASI Nucleus Teleprocessing Systems (NTS) are configured as nodes in a network that currently services some 200 branches throughout the state of New York.

Placed in key regional locations, these nodes form the backbone of a telecommunications network that allows interactive communication between centralized data bases and any of the bank's branches.

Two data centers, one in Westchester and the other in Manhattan, each with multiple host systems, satisfy the data base requirements of all branches. One center supports commercial transactions, while the other center handles retail transactions such as savings and consumer loans.

By prefixing a customer account number with a code, a teller indicates the type of service required. The NTS employs this code to direct the message to the appropriate data center.

There are four major applications supported by the NTS network. Branch tellers use Touch-Tone telephones for data entry and voice response to perform demand deposit accounting and savings and loan account queries and updates.

IBM 3270 CRT stations provide credit and account verification services. And on-line IBM 3264 automatic teller machines (ATM) enhance retail banking market penetration.

During banking hours, teller query/voice response and 3270 query/voice response transactions dominate network traffic. Bulk file transfers that ensue during business hours do not introduce any delays the teller can observe.

In the evening hours, the network's check processing system predominates, transmitting batch data to and from the regional centers and the central processing centers. The ATM network will remain on-line 24 hours per day.

Heitt is vice-president of ASI Teleprocessing, New York, N.Y.

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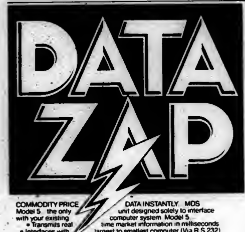

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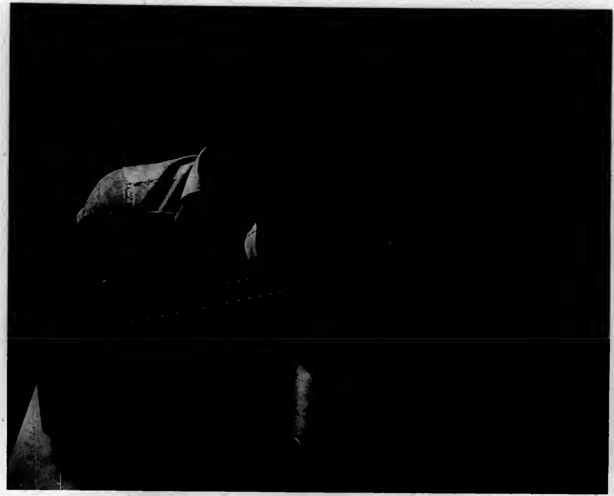

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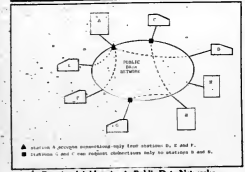
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Restricted Addressing in Public Data Networks

Public Net Users Can Build

Special to CW

Some users of public data networks are taking advantage of special features that allow them to create "private" networks within the carrier's shared facilities.

These features range from dedicated access ports and private dial-in ports with a fairly simple autoconnect mechanism to more sophisticated restricted addressing capabilities and then to completely private networks that are linked to the public network for limited functions.

For a major electronics firm using GTE Telenet Communications Corp.'s Telenet network for inventory control, the autoconnect feature is combined with dedicated access lines into the network. The firm can thereby offer its users the cost benefits of a private network and ease of use.

Data terminals in each field service office across the country are hard-wired to the closest network access node. The electronics firm's central computer is connected to the public network in the same way.

Each terminal port is programmed to automatically set up a direct connection to the network address of the firm's computer as soon as the terminal is turned on.

The advantage of this type of arrangement is that users

IDS Builds Tech Center For Networks

LINCOLN, R.I. — International Data Sciences, Inc. (IDS) has packaged much of its current product lineup into a control center that provides switching, patching, and high impedance monitoring of a network.

The Minitech Control Center also allows testing at the RS-232C or the video frequency (VF) line interface. RS-232C testing is handled on a Range Rider Model 1310 time-division multiplexer while testing at the VF line side is provided by the Model 8508 audio generator and monitor.

The control system enables on-site or, optionally, remote bulk switching of up to 164 channels from one front-end processor to another to minimize downtime when a processor fails.

The user reportedly can take the monitor jack on any individual channel and tie it into the monitor "in" port to monitor the following functions: transmit and receive data, request to send, clear to send, data set ready, data carrier detect, transmit clock, receive clock, data terminal ready, signal quality, ring indicator and busy.

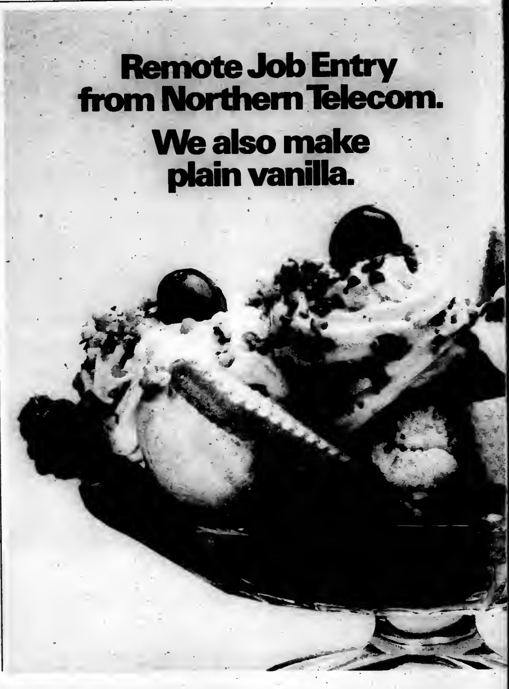
Options include an audio, video and data carrier detect alarm and a redundant power supply.

The control center is for users with up to 16 channels. The minimum configuration with two channels costs $900.

The approximate cost per channel is $300, IDS said from 7 Wellington Road, Lincoln, R.I. 02865.

Need a Teleprinter Fast?

See Page SR/27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'Private' Nets With Shared Carrier Facilities

save time by bypassing normal network log-on procedures, and the network provides them with tailor-made support for their terminal equipment and application characteristics.

By creating a virtual subnetwork, or closed user group, subscribers can put the responsibility of screening requests for connections to their mainframes onto the public network itself.

One result is that users gain an additional level of security beyond their own internal security measures for restricting access to their network facilities. These facilities include any network equipment that the subscriber uses to interface his computer or terminals to the public network, as well as any dedicated access ports or private dial ports that he orders for his users.

At the heart of the virtual subnetwork concept is restricted addressing. That is, the subscriber's network access ports can be programmed to accept requests for connections only from other specified network stations or by other parameters, such as specified cities.

A user can enhance network security by creating a virtual subnetwork, according to this article by GTE Telenet Communications Corp. Such designs hand responsibility for screening processor access requests to the public network itself.

For example, a company that provides a computerized information system for the brokerage industry has formed a closed user group within the public network that is totally transparent to its clients.

Terminals in each client office are connected by private lines to the closest Telenet access nodes. Each network terminal port is equipped with autoconnect.

When the broker turns his terminal on, he activates the autoconnect feature, receives the herald from the information service supplier and immediately begins his session.

For some companies, only a physically separate private network will satisfy its needs for security and privacy. It is in this area that the public data network carriers themselves have developed a solution that integrates the advantages of both private and public systems.

GTE Telenet, for one, supplies turnkey data network systems to business and industrial firms and other organizations. These systems are based on packet-switching technology and employ the same multimicroprocessor-based concentrators and packet switches that are used in the public network.

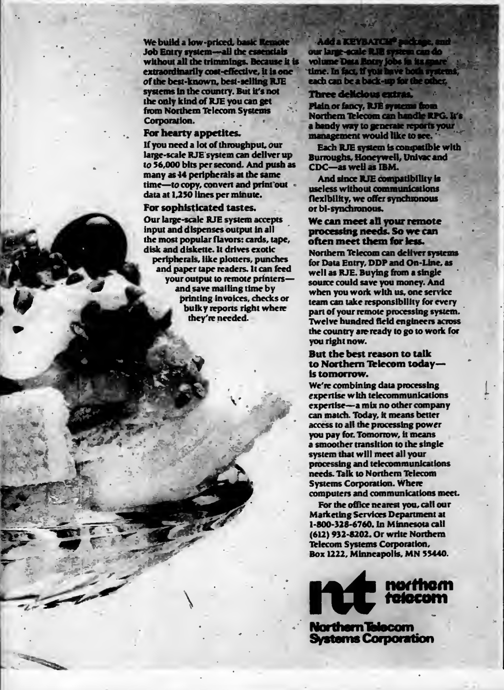
Significantly, both systems conform to the CCITT X.25 standard protocol and other related CCITT protocols for packet networks.

Network control and management in private networks can be handled in a variety of ways, depending on the client's needs for security or internal expertise in network management.

Because each network system operates with the same communications protocols, it becomes advantageous from the user's point of view to allow access to his private net via the public net from low traffic volume locations.

The private network user can also use his domestic public network connection to send and receive data from any other X.25-based public data network in the world.

Further, public nets like Telenet typically incorporate far greater redundancy in network equipment and interconnectivity of network nodes than can a private network operator.



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Teleprinters Get Buffer Storage

MOUNTAIN VIEW, Calif. — Buffer storage units are available for Teletype Corp. and Digital Equipment Corp. printers, allowing them to function as intelligent data entry workstations.

Tri-Data Corp.'s Model TSU-4 and TSU-16 buffers are intended for Teletype's Model 43 and DEC's LA34 and LA36 teleprinters, respectively. The storage units are designed on single circuit boards for installation inside the printers' enclosures.

The buffer units will allow the workstations to both send and receive text, format data off-line and transmit it at high speeds over phone lines. Unlike earlier buffers from Tri-Data, the units now buffer incoming as well as outgoing data.

The firm's Text Edit II software, implemented in read-only memory, has reportedly been supplemented with commands for two-way data transfer.

The TSU-4, with 4K char. of buffer storage, and the TSU-16, with 16K char., cost approximately $700 and $900, respectively, a Tri-Data spokeswoman said from 505 E. Middlefield Road, Mountain View, Calif. 94043.

DAA Devices Announced For Datapoint Equipment

SAN ANTONIO, Texas — Data Access Arrangement (DAA) devices are available that allow the Datapoint Corp. user to meet Federal Communications Commission (FCC) regulatiuns when connecting modems to a Direct Distance Dialing (DDD) network.

The Model 9445 — designed fur applications using manual dialing/answering equipment — and the Model 9446 — for Datapoint automatic dial/answer equipment — reportedly meet the FCC's requirement that nontelephone company equipment attached to the public phone nets be registered with the commission or connected via an FCC-registered device.

The phone line is monitored to ensure that line signal power is within the defined limits of a particular installation and that the modems are protected. Both models are compatible with Datapoint 9400, 9401, 9402, 9408 and 9409 cummunications adapters and modems, according to the manufacturer.

The 9445 and 9446 cost $175 and $250, respectively, or can be leased for $5/mo and $8/mo on a three-year term. Monthly maintenance fur the two devices costs $2 and $3, respectively, Datapoint said from 9725 Datapoint Drive, San Antonio, Texas 78284.

Courses Set In Eight Cities

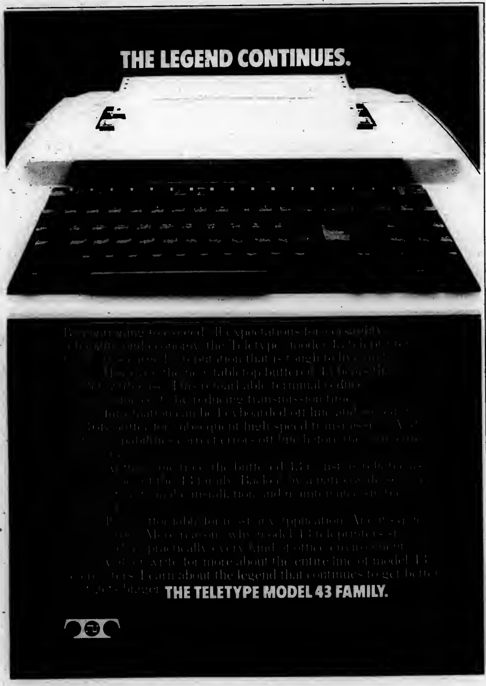
SANTA MONICA, Calif. — Intensive courses in computer-communications networks and packet switching will be given by Integtated Computer Systems, Inc. in eight U.S. cities before next summer.

The four-day courses will be held in San Francisco, Jan. 15-18; Washington, D.C., Feb. 26-29; Denver, March 4-7; and Los Angeles, March 25-28.

In the spring, the courses will also be given in Atlanta on April 15-18; Boston, April 22-25; Minneapolis, May 6-9; and San Diego, May 13-16, according to the firm, whose sole business is "continuing education in high-technology fields."

Registration costs $695, including texts, luncheons and coffee breaks. Discounts apply to three or more attendees from the same organization if billed simultaneously.

More information is available from Kim D. Samson, program manager at Integrated Computer Systems, 3304 Pico Blvd., Santa Monica, Calif. 90405.



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OEM Services Customers Remotely

By Jay Woodruff
CW Staff

WALTHAM, Mass. — An OEM has reportedly enhanced service to its customers by offering remote diagnosis through another vendor's diagnostic terminals.

Digital Programming Services, Inc. (DPSI) here has a Data General Corp. 6121 Dasher support center CRT terminal that can be linked to a similar 6120-G Dasher diagnostic terminal at the customer's site over phone lines. When the two terminals are connected, DPSI can directly access CPUs at customer sites as far away as New York City.

The customers are mostly small businesses using DG's CS/40 minicomputers. DPSI sells and installs the systems, then provides training on how to use them, according to a spokesman. The firm also provides software development through its remote access capability.

DPSI has installed approximately 30 of the CS/40 small business systems at commercial sites in the last two years. This summer, the firm was one of the first to replace ordinary DG consoles at customer sites with the diagnostic terminals, which are based on DG's 6093 terminal, according to DPSI's Norman Goldman.

Screens Duplicated

The replacement terminals add a built-in phone and modem as well as microcode to buffer the CRT contents for transmission over phone lines. When a customer encounters a file, data or machine error, for example, that he cannot solve, he can call DPSI on his terminal and, when connected, push a send key to reproduce the contents of his screen on DPSI's terminal.

A programmer can then take over the user's computer and work directly with the system as if he were at the user site, Goldman explained.

One of DPSI's customers is New England Printed Tape Co. (Nept), located in Pawtucket, R.I. The firm makes custom tapes with laminate foil or film that are used to protect signal integrity in communications cables and computers.

When a software problem surfaces at Nept that otherwise would be solved by a technician called in to work on one of its terminals, it calls DPSI and links its system to DPSI's own diagnostic terminal.

Nept installed its terminal this summer, according to Paul Farago, the firm's purchasing manager, who praised the convenience of the remote service.

"We originally had two terminals, and we were told [by DPSI] that a new piece of equipment was available," he said. Nept was interested because it was just starting to implement accounts receivable, accounts payable and other general business packages marketed by DG.

Recently, the firm had an opportunity to use the remote diagnosis system when it was trying to run a periodic accounts payable check-writing application. "The CPU has a problem with an expanding file that had too many accounts payable deletions. If there are too many, we come across a file access error and, somehow, the system is not able to pick out the vouchers to be paid," Farago explained.

"We didn't have the program to reorganize and compress the file so that we could access the vouchers because it was still under development, so we talked to my programmer at DPSI."

Three minutes after DPSI was linked to the system, the programmer had issued instructions over the phone lines from DPSI's terminal and the problem was corrected. The checks were written on schedule that day.

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Data Briefs

'Dumb' Users Get Short-Haul Modem

CHATSWORTH, Calif. — Users of asynchronous, nonintelligent terminals can transmit high-speed data over short distances with Micom Systems, Inc.'s updated 410/401 short-haul modem.

The modem provides Bell 43401 compatibility, making it suitable for transmission at speeds up to 19.2K bit/sec on leased lines. The modem can transmit up to three miles at 9,600 bit/sec and 15 miles at 1,200 bit/sec,.Micom said.

The cost of the freestanding 410/401 is $200, according to the vendor at 9551 Irondale Ave., Chatswoth, Calif. 91311.

Net Performance Logged

CHERRY HILL, N.J. — A full-duplex communications "analyzer" that measures network performance at up to 120,000 bit/sec is available from Huber Systems Corp.

With the portable Monitor I, up to 8,192 characters can be captured in memory for more detailed analysis, a spokesman said. The unit dislays 256 or 512 characters on a 5-in. CRT screen in alphanumeric or hexadecimal pairs. Ascii, Ebcdic and hexadecimal character sets are standard.

Other features include 4-char. online data traps for both transmitted and received data; parity checking; and idle character suppression. Weighing 25 lbs, the Monitor I costs $3,800 from Huber at 11 Sayer Ave., Cherry Hill, N.J. 08002.

Kits Clean Screens

CHICAGO — A kit of cleaning products for the maintenance of CRT terminals is available from Clean Screen Products, Inc.

Each kit contains one bottle of Clean Screen, one bottle of Compu Clean and 12 Video Wipes — enough to clean one terminal for a full year, the supplier said..

Compu Clean lifts dirt from the exterior cabinets of business machines such as terminals and computers by reducing surface tension. Video Wipes can dry the face of CRTs after they are sprayed with Clean Screen. The wipes absorb liquid rapidly and are lint-free, the company stated.

The Clean Team kits come in a plastic carrying bag for $10 each or $90 for a case of 12 kits. Clean Screen Products is at Suite 823, 24 N. Wabash, Chicago, Ill. 60602.

Color Monitor Available

FORT WASHINGTON, Pa. — A 13-in. color monitor with resolution greater than 600 TV lines is available from Aydin Controls.

The Model 8039 monitor is said to serve alphanumeric or limited graphics applications such as generation of graphs, diagrams and schematics. The monitor handles composite video with RS-170 compatibility and has scanning frequency capabilities in the 15 kHz to 18 kHz range horizontally and the 50 Hz to 60 Hz range vertically.

In OEM quantities, the Model 8039 costs $1,375. Aydin Controls is at 414 Commerce Drive, Fort Washington, Pa. 19034.

IRM and DBA: Converging on the '80s

By Anne Hufman and James Landerkin

Information management remains the stepchild of data processing. It's time to manage information as any other corporate resource, the authors say. Both data base administration and information resource management are vital to harnessing the power of the computer to serve total information needs.

Organizations produce information to sustain themselves. Traditionally, responsibility for determining the required information and then providing it has been distributed throughout the organization. An individual manager must perceive what information is needed and produce it by whatever means can be devised.

Data base administration (DBA) centralizes much of this responsibility. It is a function closely associated with DP that provides data resources for the organization as a whole to use. From the data produced, the organization derives both predictable information regularly needed in its operations and unpredictable or fact-finding information often needed by management. Specific needs of the latter kind cannot be anticipated.

Independent Applications

The traditional approach for automating DP has been to develop several completely independent applications such as billing and collection, payroll, general ledger or inventory control. Each application "owns" the data it uses, and the application developers orient the data of each aplication's requirements. Under this approach, fact-finding by management requires writing special programs, modifying existing programs or resorting to manual data collection and analysis.

During the past 20 years, many such independent applications have been developed. Most required extensive software and formal procedures for production operation. The application life cycle included stating requirements, preparing first a logical design and then a physical design, constructing the necessary software and data files, implementing production operation and ongoing production and maintaining the application. The pattern became familiar.

It is the final stage in this cycle that is enlightening: many of the applications developed, both large and small, died. That is, the software died; the particular design approach became outmoded; the file structure needed revision.

But the data did not die. A reimplementation to replace the original application included a data conversion process. Figure 1 illustrates this.

Repeated conversions of applications and management's need for fact-finding information encourage the view that data is a resource. As with any resource, there are costs associated with making them available, including costs of collection, maintenance, storage and distribution. Additional costs arise when methods are inefficient or when misinformation is produced.

Today, data base management systems (DBMS) deal effectively with the costs associated with supplying data to an organization and producing from the data information for daily operations and ad-hoc requirements. Figure 2 illustrates the data base approach.

What is DBA?

DBA is an integral part of an organization's commitment to meet its information needs by the data base approach and to use its DBMS effectively. Personnel throughout the organization need to know on a selective basis the contents of the data bases created; they also need to learn about the resources available as data bases are expanded and new ones added.

Access to data bases and data security become organizationwide issues. The DBMS itself requires technical support and that people throughout the organization be educated.

DBA is a function, not a position in the organization. It requires different people to cover the range of work to be done. People are needed to deal with present data resources in whatever form, to develop new data resources that may be required and to improve or support the ways data is used to produce information. For the purposes of this article, "DBA" refers to both the people and the function.

DBA interfaces with other parts of the organization, especially personnel responsible for computer facility operations, systems development and information resource management, all in addition to the end users for whom the information is produced. This coordination function is composed of several major categories of activity:

Planning. DBA offers a planned approach to supplying data. Therefore, planning is of major importance.

Administration. DBA offers an orderly approach to supplying data. Standards and procedures create the orderliness when properly administered.

Training. DBA is responsible for providing training in data base techniques for personnel in systems and programming, user groups, management and computer operations.

Documentation. By centralizing responsibility for data, DBA increases the importance of documentation.

Consulting. DBA acts as an authority on the DBMS and its applications and supports and guides the organization's use of the package.

Monitoring. DBA must continually review activities related to the data approach to ensure efficient system performance and satisfaction of user needs.

Refining. As DBA centralizes responsibility for data, improvements can be made in methods and processes. Such refinements are an outgrowth of

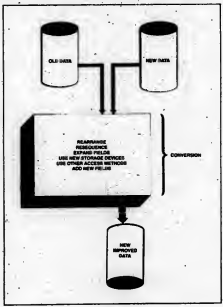


Figure 1

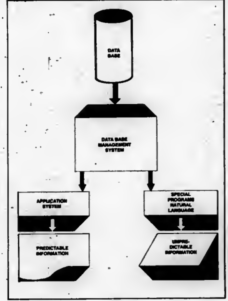
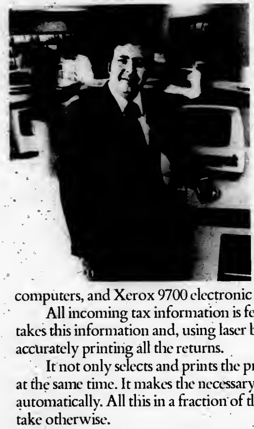


Figure 2

(Continued on In Depth/3)

"HASTE MAKES LESS WASTE."

Stephen Winn, President
Fast-Tax (Computer Language Research, Inc.)
Dallas, Texas



Stephen Winn heads one of the most aptly named organizations in America.

Fast-Tax is a computer company that processes taxes. Fast.

Hundreds of thousands of income tax returns are sent here from prominent accounting firms all over the world. And Fast-Tax processes them at speeds of up to a million pages a day.

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(Continued from In Depth/1)

monitoring.

These major activities are performed by the DBA function at the U.S. Army's Harry Diamond Laboratories (HDL) in Adelphi, Md. This function supports the information needs of a diverse group of users, from comptroller to research and development scientists and engineers. Since installing a DBMS (MRI Systems Corp.'s System 2000) in 1976, HDL has steadily progressed from the traditional approach toward the data base approach.

At HDL, the DBA function acts as an intermediary between a user's request and the delivery of the requested information source (See Fig. 3).

If the requested data is available in another functional group's existing data base, access to that is arranged between the requesting user and the data's "owner". This knowledge of existing data satisfies the user's request, while conserving costly analysis and design resources. By serving as the coordinator between functional users, the DBA function enhances data base security and assures privacy.

When the data request involves the development of a new data structure, the DBA function serves as the project manager. By consulting with both the analyst and the user, the DBA function assures that the user's request will be filled accurately and that existing resources will be used whenever possible.

Once the specifications are created, the project moves to the design phase. Programmers use their knowledge of existing standard systems to produce a "data-based" interface that delivers the requested data to the user.

If the user requires new data as well, the implementation group defines the new fields and modifies the existing data to accommodate the user. The DBA function monitors the project's status at all points to ensure that system wide standards will be adhered to and that the user's needs will be met.

Primary Benefits

HDL has reaped several major benefits since the implementation of data base administration, these being among the most important:

- Availability of information across functional lines.
- Immediate access to timely and accurate data.
- Fast response to ad-hoc queries.
- Increased visibility of data, which has necessitated resolution of discrepancies in definitions across functional lines.
- More flexible systems — better response to new requirements.
- User ability to interrogate data and, in turn, to clean up one's own data.

DBA is at the very least, a body of loosely related activities that plays a role in supplying the information an organization needs. In its fully developed form, DBA is a full-fledged function with in the organization and is staffed with personnel who constitute a formal unit.

The scope and importance of the function are such that the development must be deliberate, even gradual. It is a building process in which each step depends on the structures previously raised.

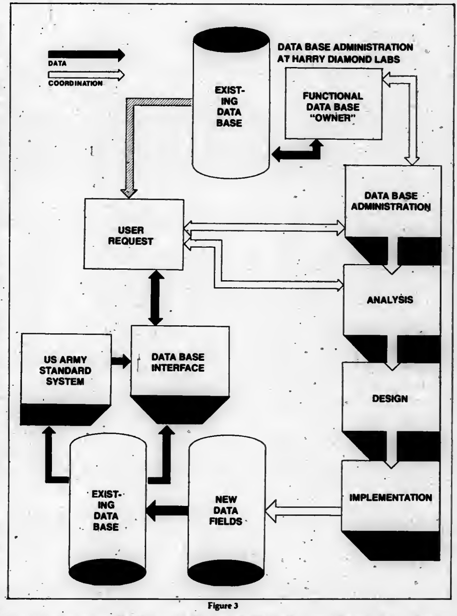

Figure 3

Establishing DBA requires extensive knowledge of the organization an insight into its objectives and functioning. Another important ingredient is the ability to objectively appraise the organization's procedures and personnel.

DBA is an agent of order and organization, which may change. Some pain almost always accompanies change, and resistance to pain is reflex action. For DBA to expand and flourish within an organization, there must be some way of seeing beyond the pain of change. Teamwork an cooperation are more than important — they are essential.

Role of IRM

The time is right for information in an organization to be managed directly. All too often, it is merely a byproduct of the organization's DP function. Information is a valuable resource, less tangible than, but in other ways similar to, an organization's financial resources.

The resource must be developed and made available. Its value must be clarified and its production and use monitored. All of this requires a change in corporate thinking and action, and information resource management (IRM) is proposed as the agent of the change.

IRM should encompass two perspec-

(Continued on In Depth/6)

R.W. Bare, Assistant Corporate Controller, J I Case, A Tenneco Company, Racine, Wisconsin

The IBM Series/1 is a family of small, powerful, general-purpose computers for both distributed processing and standalone use. At over 50 company-owned stores nationwide of J I Case, a leading manufacturer of construction equipment and farm machinery, Series/1 systems are resulting in greater customer satisfaction through faster service on crucial parts orders.

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"By speeding order handling and accounting procedures, the system has cut related workloads in half in some stores, helping to support a 10% to 20% growth in parts sales in the stores in which it is used. This productivity benefit alone justifies the system for us. Most important, by transmitting consolidated data daily to Case headquarters, it gives management greater control over financial and production planning."

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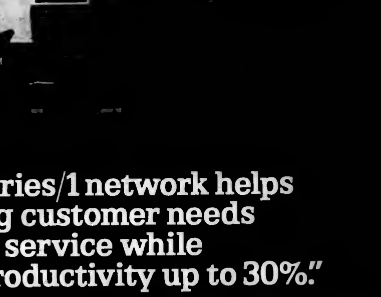
"Our IBM Series/1 network helps meet growing customer needs for parts and service while increasing productivity up to 30%."

you at any terminal just as quickly as it's processed. And because it's modular, Series/1 is ready to grow when you are. What's more, Series/1 is supported by an extensive service organization that enables IBM to respond promptly to your service needs, even in remote areas.

To learn more about the Series/1, get in touch with your nearby IBM General Systems Division office. Or write IBM, P.O. Box 2068, Atlanta, GA 30301.



The remarkably flexible IBM Series/1 offers a range of modular features that allows you to build the data processing system you need at a low cost.

IBM.

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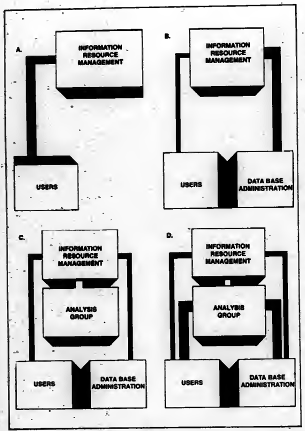

Figure 4

(Continued from In Depth/3)

tives if it is to be successful. The *usage perspective* views data as it is used. The same data may be viewed many ways within a given company. Consolidating these views yields the *information perspective* that expresses the natural relationships among data items.

To date, primary emphasis has been on the usage perspective. A shift in emphasis to the information perspective is required for informtion to become a corporate resource rather than the property of an individual user.

IRM is responsible for defining and maintaining the logical statement of both views of data within the firm. This responsibility includes defining and planning all new uses of data within the organization and ensuring that these uses correspond to the corporate information perspective.

These activities are independent of the DBMS the organization uses and the physical designs of data bases for that DBMS. It should be noted that a mapping of physical design into a logical statement will be required for existing DBMs applications.

IRM is the ombudsman for all user information needs (See Figure 4A). As such, this function is the catalyst for changing the traditional approach to information management. All user requests for data go through the IRM office

IRM will check with DBA to see if the information request can be met within existing data base design. (Figure 4B). If the request cannot be met within existing data bases, or if the request is not clearly specified, IRM will have an analysis team review the request for concise specification (Figure 4C). This team will consult will both the users and DBA in order to be both concise and specific in the logical statement of requirements (Figure 4D).

When the logical specifications are approved by the user, DBA and IRM, they are given to a design group to generate a physical design for software and the data base (See Figure 5A). When the physical specifications are complete, the programming group encodes them, consulting with the DBA and design group as necessary (Figure 5B).

Upon completion of the software, the implementation group verifies its accuracy and effectiveness while the DBA checks its efficiency. The implementation group will present these verification results, along with user

(Continued on In Depth/8)

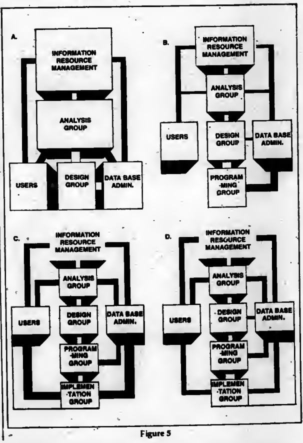

Figure 5

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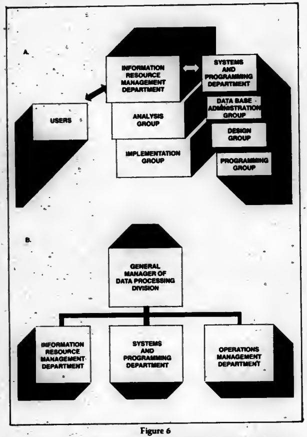
IN DEPTH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SYSTEMS AND PROGRAMMING DEPARTMENT
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ANALYSIS GROUP
DATA BASE ADMINISTRATION GROUP
DESIGN GROUP
IMPLEMENTATION GROUP
PROGRAMMING GROUP
B.
GENERAL MANAGER OF DATA PROCESSING DIVISION
INFORMATION RESOURCE MANAGEMENT DEPARTMENT
SYSTEMS AND PROGRAMMING DEPARTMENT
OPERATIONS MANAGEMENT DEPARTMENT

Figure 6

(Continued from In Depth/6)

documentation and training, to the users, thus completing the cycle (Figure 5C).

The full line of communications is shown in Figure 5D. This is just one of many scenarios showing the involvement of the user, IRM and DBA.

Figure 5D can be functionally reduced to three areas, as in Figure 6A. All users interface with the IRM department, which in turn has responsibility for interfacing with the systems and programming department. The DBMS and its administration need not interface directly with users. These two departments are joined by the third, operations, in comprising the corporate data processing division (Figure 6B).

In summary, the time has come to recognize information as an important corporate resource and manage it as such. IRM is the key to integrating corporate data needs and to instilling cost-effectiveness evaluations into DP activities.

There are numerous obstacles to overcome. Information must be classified and managed as a corporate resource in spite of its intangibility. The difficulty in identifying, integrating and planning corporate information needs must be conquered. Accordingly, information orientation must move from multiple application-driven (usage) perspectives to a singular information perspective.

The role and responsibilities of IRM must be clear and placed high enough within the organization to effect change. The view must be encouraged that redistribution of responsibilities resulting from establishing the IRM role relieves a burden on managers as opposed to taking away some of their power.

Most important, IRM must be viewed as a step in the direction of progress and one that can be taken successfully.

IRM and DBA are functions for producing information efficiently and using it effectively. The two functions complement each other. Together they can span the distance between computer technology with all its potential on the one hand and an organization's management and operations — with many information needs and uses — on the other.

To distinguish between information an organization needs and information it uses is not frivolous. Needed information is that without which an organization cannot fulfill its responsibilities or achieve its objectives. However, additional information the organization can put to good use if it is available, or information the organization erroneously believes it needs, should not be classed as needed.

IRM helps to determine an organization's information needs. DBA facilitates the production of information the organization uses — information it needs as well as information that is advantageous to have. Both functions contribute to disseminating throughout the organization the information that is produced.

Anne Hufman is the data base administrator at Harry Diamond Laboratories, Adelphi, Md., one of the seven labs in the Department of the Army's Electronics Research and Development Command.

She has been a member of the Management Information Systems Office since 1975 and was part of the management study team to determine the information requirements for all the organizational elements at HDL.

Instrumental in the acquisition of the DBMS for HDL, Hufman has administered the development of data base systems in such areas as financial management, procurement, supply, property and security.

Hufman holds a B.S. degree from American University.

James Landerkin is a national account manager in the federal marketing division of MRI Systems Corp., Austin, Texas.

Landerkin has been active in various segments of the DP industry for nine years, marketing and servicing both hardware and software. Since joining MRI in 1978, he has developed and given various presentations on data base administration and information resource management.

Landerkin has a B.S. degree from the University of Baltimore.

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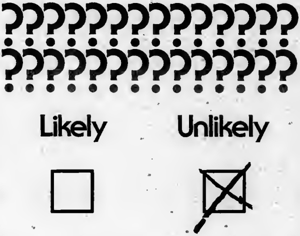
IBM Data Base Surprises??

With no relational system in the immediate future, IMS remains the premier IBM data base product. Surprises that would invalidate a DBMS choice other than IMS are improbable, contends the author.



By Ronald Ross

The reasons for purchasing IBM's Information Management Systems (IMS), rather than any other data base management system (DBMS), are *not* compelling for every given set of application circumstances.

That was the conclusion of Performance Development Corp. (PDC) in an article addressing the IBM DBMS question.

Every corporate situation, we argued in "Should You Hitch Your Wagon to IBM DBMS?" [CW, March 5], should be considered on its own terms. Based upon the unique set of data base requirements, a DBMS should then be chosen that best fits the individual case. That choice is not, as we stated, always IMS, "vague promises of mainstream bliss notwithstanding."

Nearly 10 months have passed, certainly sufficient time in our industry to warrant reassessment. Our opinion stands: Mainstream data base surprises from IBM, which would invalidate any DBMS choice other than IMS, continue to be unlikely.

Consider the product announcements IBM has made in the interim. The one with the biggest splash, of course, was the 4300, but its significance seems mostly in its exciting cost/performance ratio. Release 3.0 of the DB/DC Data dictionary (DD) appeared last July, but with no particular fanfare and certainly without creating any devastating shock waves. (Don't underestimate this release, however — it may have the market hopping within a few short months.) Finally, by the time this article goes to press, the Series H may have been announced, but the odds are those systems will make no more *direct* splash in the data area than the 4300 did.

IBM's Game Plan

What is IBM's game plan in the data base area? First and foremost, the key concept in the company's marketing strategy has become *orderly* migration. It wants no part of a new 360 revolution and is willing to forgo many short-term advantages to avoid it.

Second — and this observation may in fact be a corollary of the first — it recognizes that the upper limit of product innovation is much slower than many observers on the outside, not privy to its "inside" market data, might realize. Future-shocked customers are ones whose loyalties to IBM may become confused — the cardinal sin in the IBM theology.

Third — this part of IBM's strategy must be interpreted *very* carefully — it does nor appear overly anxious to do anything but compete in the now solidly established software industry. It could certainly have moved by now to lock out competitive DBMS and data dictionary systems (DDS), but hasn't. It could still do so, but because of the antitrust implications, such action seems unlikely. Court cases are expensive, not good for the corporate image and probably also bad for morale. Best to play the game fairly, even if the rule book is in your pocket 95% of the time.

Additional comments on the IBM data base question are contained in the November 1979 issue of Data Base Newsletter, *a free copy of which is available from Professional Development Corp., Building P, 1101 State Road, Princeton, N.J. 08540.*

Relational Systems — When?

If one accepts these premises (or the first two, anyway), speculating about when IBM will offer a relational DBMS becomes easy. It won't offer one until data maintained under the relational system can be made shareable with IMS-style applications.

The sharing of data does not necessarily mean that IMS and the relational DBMS would be operating on the same data at the same time. The traditional problems of deadlock and integrity control would be too substantial. Instead, it is more likely that the data would be under the control of the relational DBMs, which would support IMS-style hierarchical views.

Under this scenario, IMS as a discrete system disappears from the data management complex even though many of its concepts and views linger on. This fits well with the objective of orderly migration; the old soldier doesn't die, it just gradually fades away.

Sharing data between IMS and any relational system worth the name is, of course, not possible under today's storage technology. Nor does it appear to be possible, at least given the best available evidence, under any storage technology on the immediate horizon. That includes anything the Series H might have to offer.

The problem is not that data shareability is too difficult to achieve, but rather that the performance penalties, given available or near-available technology, remain too substantial. To truly support "orderly migration," a new offering would have to support heavy IMS-style access and heavy relational-style access simultaneously.. Acceptable performance under one or the other may be achievable now, but not both at the same time.

Indications are that IBM already knows this is the case. It probably has already tested its next line ofdata store technology (Vsam boxes?) and has found this to be true.

By simple deduction, then, IBM will not offer any relational system in the immediate future. This conclusion is consistent, incidentally, with the firm's long-held, quasi-official position on System R — that it is nothing more than a prototype system and will never be marketed in its present form. (Unfortunately, IBM has said this so many times that the issue has taken on the ambivalent nature of a Kennedy noncandidacy for President.)

Is this assessment consistent with the three key factors in the IBM game plan? Yes, yes and yes. Although it does not seize upon short-term potentials, it does base IBM data base strategy solidly on the orderly migration concept. The strategy avoids future shock by allowing more collective experience to accumulate for data base and data dictionary. (For those pioneers ready for the future, IBM will be offering new types of DDS and implementation playthings.)

Finally, the strategy does not disrupt the software marketplace. (Even if this is not one of IBM's intentions, but only a by-product of the others, it still works out as a positive thing for the DP community.)

Two Possible Disruptions

What might throw a wrench into IBM's data base works? Two possible situations come to mind.

First, a mainframe competitor might develop and announce both a new storage methodology *and* a relational offering so convincingly powerful that IBM would perceive a danger of erosion in its hardware sales. A competitor would not have to worry as much about data sharing and therefore might conceivably build a nonshareable (or at least nonoptimal) version reasonably soon.

There is no evidence that this is about to happen. In any case, the possibility is relatively remote that such a development would accumulate enough "live" demonstration time and credibility quickly enough to push IBM into earlier-than-anticipated action. Anyway, it would probably take a lot more than simply a flashy new relational offering to "de-entrench" most

(Continued on In Depth/12)

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IN DEPTH

(Continued from In Depth/9)

IBM users.

As a second possibility, independent DBMS vendors might seize upon a new storage methodology IBM does not exploit — a new Vsam box, for example — to build new relational offerings. (Several vendors, in fact, are poised to do just that.)

What are the facts in this case? First, there is no danger in hardware erosion from such offerings.

Second, the Vsam black box is equally available to all DBMS, including IMS, for performance improvements.

Third, the time from announcement to serious impact on IMS use is by no means immediate. The independent vendor must analyze the new technology; develop new software support, put a marketing plan into motion, let pioneers try the system out, analyze the results and adjust the system accordingly. Then, if the results are positive, the vendor can broadcast the results to the market at large. This market does not, incidentally, include most IMS users, since no migration path would be offered.

Meanwhile, IBM is working on a new data store and a new DBMS to go with it, which would make the independents' new offerings obsolete.

In spite of IBM's realization that it has underestimated the independents many times in the past, all these facts add up to a reasonable risk. Pressure from the independents is not enough to deter IBM from its game plan.

If there is no relational system on the immediate horizon — at least in the game plan — IMS is left as the premier IBM data base product. Many blue-chip IBM users have a lot of money invested in IMS and even IBM's giant corporate body is not insensitive to this. You can bet, then, that IBM won't be abandoning IMS, even in a developmental sense.

If you thought that IBM was about to freeze IMS, you were definitely wrong.

IMS concepts and methodologies will therefore continue to be with us through much of the 1980s. This will be true even if pieces of the inner system gradually disappear — for example, through higher-level support through a DDS or by replacement by a relational DBMS.

How then will IBM attempt to address IMS short-comings?. In the March 5 article, the following problem areas were cited:

- *Performance*. The independents have successfully assailed IMS on the performance issue for many years. The problem does not seem to lie in wayward routines — much of IMS has been gradually rewritten over the years — but rather in a system concept that was not conceived or implemented with performance as its overriding objective. This, certainly, is not unlike IBM, but to accuse IBM of taking this approach solely to sell more iron too atrongly states the case.

Potential solutions to the performance problem lie in the hardware area. If IBM can make even the resource-consuming software of IMS so cheap to run that nobody really minds, it has won the performance issue by default.

IBM can achieve this end in several ways:

1. Introduce more powerful machines. (It is doing just that.)

2. Put DL/I into the hardware. (This is unlikely.)

3. Develop new and faster data store technology.

Even though IBM is known to have experimented with DL/I microcoding, the second route is highly unlikely. First of all, it narrows the concept of a "general-purpose" business machine, and IBM is not yet willing to do that.

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Second, this approach might entrench IBM too strongly in an IMS mode — a way of life it might eventually like to abandon.

Third, IBM is faced with the unsavory fact that an American National Standard for data base language, or at least a Federal Information Processing Standard, is very probable within the next several years. It would probably support such a standard. Microcoded DL/1 runs counter to that potential requirement area.

Emphasizing innovation in data store technology, however, does not. In fact, just as new data store technology is the eventual solution to IBM's relational designs, it is also amenable to the possible requirement for a standardized DBMS.

The first level of such innovation, a new Vsam box, is good for everybody. It is certainly good for IMS and for any standardized DBMS requirement as well. If it is also good for the other DBMS, this too is OK, since better data base methodology means more data base applications, and more data base applications mean more iron sold. It is also good, incidentally, for all those applications that use just Vsam (or Isam) and there are a lot of those around.

Two more points are worth noting. First, microcoded DL/I would lock out users of other DBMS. Even if altruism is not IBM's motive, the company would have a lot of disgruntled hardware users on its hands if it did something like that. IBM knows that because of the trauma of conversions, non-IMS users would not readily convert to IMS. And the plug-compatible manufacturers are waiting in the wings, just like vultures, for such an opportunity to arise.

Finally, microcoding DL/I is probably very difficult, even for IBM. Perhaps it is *too* difficult for the potential performance improvements (and the industry grief) it might bring.

• *Documentation.* The IBM approach to documentation appears at times like a variation of the nuclear arms race. The central ideas in its approach, inseparably interwoven, are "overkill" and "survival ratio." The company produces tremendous volume, reasoning that at least a portion should survive all obstacles and reach its target. Even though single, well-placed shots would solve the difficulty, overkill is deemed the "minimum risk" strategy.

Well-placed documentation shots require confidence. You've got to be willing to say you *know* what types of questions specific users will ask, as well as how they will ask them. Is the IMS documentation riddle so complex that even IBM can't find a key?

Indications are that IBM intends to render IMS documentation more task-oriented. The user community will certainly welcome such efforts.

• *Difficulty of IMS data base implementation.* IMS has the dubious distinction of being most often cited as the most complex DBMS. This characterization, however, is somewhat overstated. *All* DBMS are complex; IMS just happens to be the most offending of the lot.

Complexity is a subjective thing. Everyone knows, for example, that OS is complex, whereas Basic is, well, basic. But what can be used to distinguish between them?

Do 10 system generation options make a system complex? Fifty? One hundred fifty? Does a system that takes 100 pages to document qualify as complex? Five hundred? Fifteen hundred?

Is the system complex if it has one successful competitor? Five competitors?

If the system allows the vendor to market one "support" package? A half dozen?

None of these questions yield incontrovertible evidence. When applied to IMS, however, and to other types of systems with which the DP community is familiar, they do begin to throw a great deal of suspicion in the IMS direction.

What can IBM do about this alleged complexity? One course open to it, which it has already begun to actively pursue, is to develop application program generators.

An application program generator supplants application coding by generating programs automatically based on processing specifications provided by users. Such generators (IBM now offers ADF for IMS/DC and DMS for DL/I/CICS) have, to

(Continued on In Depth/14)

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(Continued from In Depth/13)

IBM's apparent satisfaction, demonstrated dramatic improvements in programmer productivity while slipping only slightly in execution performance.

Doubts linger over processing comprehensiveness, and the effectiveness of DL/I interfaces, but we believe IBM is already actively promoting the idea that the IMS user should consider ADF or DMS for every type of processing requirement that may arise.

Another thing IBM can do to make IMS less complex is to bury the various types of system generation procedures within the DDS. Release 3.0 of its DDS has, in fact, laid significant groundwork for just such a move.

- *Lack of end-user orientation.* This remains the largest single failing of IMS. IQF, which led a troubled life, was quietly laid to rest several years ago. No other query language has stepped forward to take its place, nor is one likely.

Much of IBM's interest in the relational model arises in response to this notable fault. ADF and DMS may improve the system implementation turnaround rate, just as relational systems would, but they do nothing, at least directly, to correct the lack of end-user orientation.

IMS: Due Process

In fairness to IMS, now that its weaknesses have been identified, some attention should also be given to its strong points.

- *State-of-the-art data base support.* There is no doubt that IMS is fully capable of supporting many types of complex data base applications. Its data structuring and access methodologies, though complex, are at least as effective (when used correctly) as those of any other DBMS.
- *Back-up/recovery/integrity.* IMS is noted for strength in these areas. The IMS data base is at least as recoverable as any other type of data base and probably more so.
- *Data communications.* Either CICS or IMS/DC, though both complex, are certainly more than adequate for the common teleprocessing needs of most users.
- *Data dictionary.* With Release 3.0, IBM has taken an unanticipated leap forward within the dictionary arena. Its offering must be considered at least comparable in many respects to any of the best packages on the market and certainly much stronger than the offerings of several independent DBMS vendors.

The corporate data resource development strategist faces a complex task in planning his corporation's data base future, a task made even more difficult by the many peripheral areas with which such planning must be concerned. In giving due consideration to DL/I futures, certain additional areas must be examined:

- *DDS lock-out.* The best evidence indicates that IBM will not require its IMS users to purchase the DB/DC DD within the foreseeable future. There will not, therefore, be any imminent lock-out for users of other packages. The advantages, however, of having IBM's product, or that of some other vendor, are increasingly clear-cut. IBM knows that by the end of the 1980s, most shops will have one DDS or another.

It is worth noting in this vein that IBM is upgrading of the support class the DB/DC DD to "A" status this year. This is certainly in line with its near-future emphasis on the data dictionary as a front-line productivity support tool for IMS.

- *Nonstop IMS.* Users can expect a nonstop version of IMS in the next several years. According to one source, there are already some 40 to 50 installations that would like to be able to run IMS 24 hours a day, seven days a week.

One implication is that all utilities

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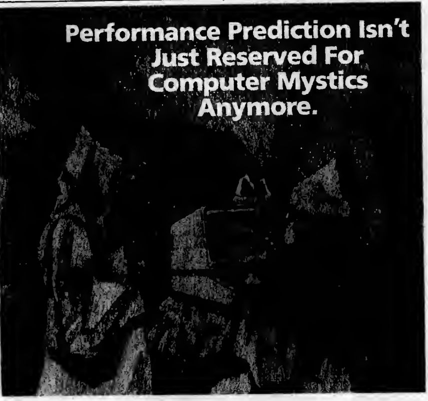
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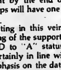

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IN DEPTH

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and definitional processes will have to be made to operate on-the-fly. If IBM accomplishes this feat, without fudging significantly, this would become a major new strength within the IBM camp.

- *Teleprocessing:* Somehow, the supposedly unitary data management offspring conceived and nurtured by IBM turned out as Siamese twins. Both of the children, IMS/DC and CICS, are healthy, well-formed and still growing. Each is held in more or less equal favor by their parent.

Unfortunately, the children are inseparably linked at the head and the heart (data dictionary and data base, respectively). The IBM data management complex thus has two sets of arms and legs, both vying to carry the data base portion about, but neither able to do so without the complicity of the other.

IBM cares for both its children — equally, it says — and appears ready to continue nurturing both. Unfortunately, this means the complex has a double grip on its parent, which makes prodding it toward more user friendly terrain all that much more difficult.

- *Distributed processing.* IBM now apparently believes that the problem with distributed DP (DDP) is no longer computing power (its newest machines probably have passed well beyond the threshold in that respect) but rather learning *how* to distribute data. MSC and ISC, which still have only a handful of users, are only first steps in that direction. DDP solutions are coming, but they are still years away.
- *Data base futures.* Relational or DDP offerings from IBM, or any other vendor, are *not* the end-all solution to data management problems. Indeed, many observers say the data base world won't even reach adolescence until basic data dictionary lessons are learned.

But relational and DDP systems will not be panaceas. There are many areas, both of an administrative and a technical nature, that these offerings won't even touch.

Rather than approaching adolescence, the data base world is probably still in its infancy.

It is fine to be in the mainstream if it can move your corporation's data cargo to the destination you desire.

However, the route to some destinations is less appealing than to others, and some destinations are not served at all.

In formulating a data base development path, each means of DBMS transport should be considered. The one that best serves a particular destination may or may not prove to be IMS. Our assessment is, if you wisely follow your judgment in this area, even when it tells you IMS is not the way to go, IBM is unlikely to throw anything into the path that will upset your data base applecart.

Ronald G. Ross is editor of the Data Base Newsletter, *a bimonthly publication of Performance Development Corp., a data base consulting firm in Princeton, N.J.*

Ross is the author of a number of other professional publications, including Data Base Systems: Design, Implementation and Management *(Amacom, 1978) and* IMS Concepts *(PDC, 1979), a comprehensive introduction to IBM's Information Management Systems.*

His current interests include data dictionary systems development, data base design methodologies and data administration strategies.

Ross holds a B.A. degree from Rice University and an M.S. degree from the Illinois Institute of Technology.

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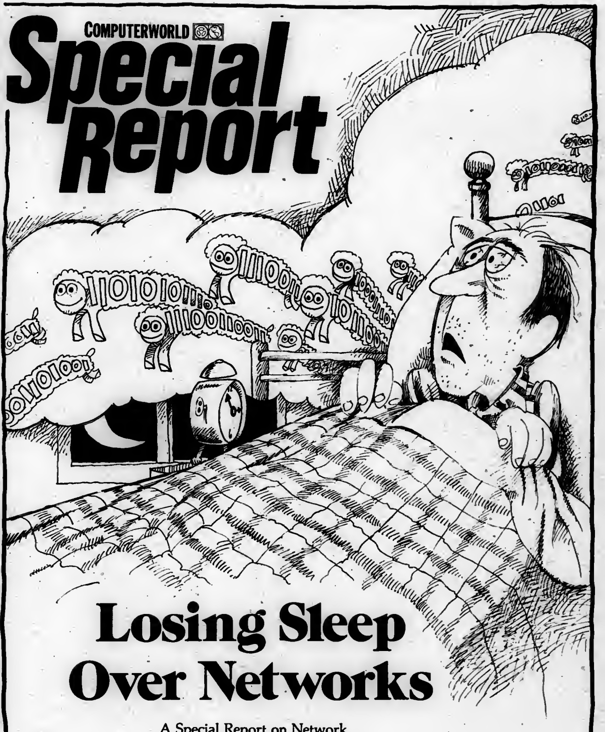

Losing Sleep Over Networks

A Special Report on Network Reliability, Integrity and Security

Edited by Brad Schultz

November 26, 1979

Nodes and Links Critical

Packet Nets Offer High Reliability, Security

By Morty M. Eisen
Special to CW

Reliability analysis for computer networks is a critical area. System designers are primarily concerned with the dependence of the reliability of the network on the reliability of its nodes and links.

Element reliability is easily defined as the length of time an element is operable, but the proper measure of *network* reliability is not as clear or simple.

Possible measures of network reliability include the number of elements that must be removed to disrupt communication between two or more sites; the probability that such network disruption will occur; the expected length of time that pairs of sites cannot communicate through the network; and the expected numer of transactions the network can handle while subject to element failures.

Many other measures can be employed when the sites are not of equal importance, as with centralized or hierarchical networks. In a centralized network, such as a conventional message-switched store-and-forward system, the expected time during which the sites cannot communicate with the central facility may be a primary criterion for estimating the network's reliability.

The reliability characteristics of a distributed packet-switched network are totally different from those of other presently available network technologies. In order to understand why this is so, let us look at an overview of a distributed packet-switching network.

Distributed packet-switching has emerged over the last few years as a viable and cost-effective method of coping with a variety of problems encountered in trying to achieve efficient and versatile data communications.

Heavy vendor investments in development have resulted from a proliferation of offerings for both private and public access packet-switched networks. Development, coupled with continued technological progress, has produced cost trends that will further favor packet-switching, which should remain the most appropriate alternative for large users for at least the next 10 years.

In addition, trends toward digital voice futther reinforce the viability and long-term stability of packet-switched networks as they appear attractive for integrated voice-data applications.

Distributed packet-switched networks consist of the following elements:

- Microcomputer- or minicomputer-based hardware that performs communications functions and is used primarily for data switching — sometimes referred to as communications processors (CP).
- Microcomputer- or minicomputer-based hardware used as data concentrators — sometimes referred to as interface processors (IP).
- One or more minicomputer-based Network Control Centers:
- Carrier-provided digital and analog transmission facilities — including satellite and earth sites.

The above elements may be combined in a variety of ways to form hierarchical as well as distributed packet networks. User computers — called "hosts" — and data terminals access the elements through a variety of dedicated and dialed facilities.

Many users consider the greatest benefit of packet-switching networks to be their relatively high reliability.

(Continued on SR/27)

Missing Tool in Net Management

Systematic Reporting Gauges Reliability

By Dr. Philip A. Tenkhoff
Special to CW

Users, operators and desigers of networks all agree that reliability is one of the most important, if not *the* most important, criteria for data communications networks. Yet, surprisingly, the measurement and reportings of network reliability are often either nonexistent or conducted in an ad hoc fashion.

Often, one hears that "the network is down too often," but a quantitative assessment of "too often" is conspicuously absent.

Or, we hear that "there are too many interruptions," but no measurement exists to substantiate "too many" or to identify the location of these interruptions.

A systematic approach to the measurement of network reliability should not be undertaken merely because it would be "nice" to have a well-documented history of network performance. On the contrary there are several compelling reasons to measure and report network reliability in a regolar and well-organized fashion.

Major Benefits

Quantitative measurements of network reliability have major benefits for those concerned with network operation. Those benefits include providing:

- Meaningful assessment of performance vs. established objectives.
- Assessment of trends (both positive and negative).
- A basis for redundancy trade-offs.
- Identification of problem components.
- Identification of problem geographical areas.
- A basis for assessment of vendor performance.
- A basis for network configuration adjustments.

Defining Subsystems

Modern data communications networks are composed of complex assortments of components linked together to render a message transfer function. The failure of one or more of these components can cause outages to all or part of a network.

To produce a framework for meaningful measurement, it is convenient to group the components into subsystems. The grouping should be chosen at a level soch that a quantitative reliability measurement can be made for each subsystem.

For example, a point-to-point analog four-wire circuit could be a subsystem. Although that particular circuit is composed of a vast array of carrier multiplexer equipment, antennae, repeaters, modulators, amplifers and demodulators, the performance of this gear is neither of interest to, nor capable of being measured by, the network operator.

Other examples of subsystems that exist in data networks are: modems, multiplexers, concentrators, software, terminals, power supplies, personnel and operating environments.

Creating Data Base

After defining subsystems, it is necessary to provide for the systematic measurement and recording of all events that affect the subsystems' availability. Recording can be automatic or manual. Information to be logged includes time of outage, subsystem(s) affected, time of restoral and cause of outage.

All this information should be placed in a common data base for the generation of reports and subsequent analy-

(Continued on SR/26)

Thanks to INPs, Small Nets Gain Big Nets' Functionality

By Art Lynch
Special to CW

The capabilities necessary to ensure reliability and data integrity in communications networks are now available to smaller users as a result of developments in technology and market demand.

To understand why such capabilities are no longer restricted to very large users, it is useful to review how the art of ensuring reliability and integrity has progressed.

Elaborate hardware and software mechanisms became necessary to compensate for the reliability and integrity problems of two merging technologies, computing and telecommunications. This merging, which allowed DP to move from a batch orientation to a real-time transaction orientation in its applications, entailed the deployment of large numbers of terminal devices connected upward in a hierarchy of large, centralized DP systems.

Computing was implemented by state-of-the-art semiconductor technology, which yielded.

- Impressive data integrity.

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Networks Pose Special Dangers Of DP Fraud

By Leonard I. Krauss
And Aileen MacGahan
Special to CW

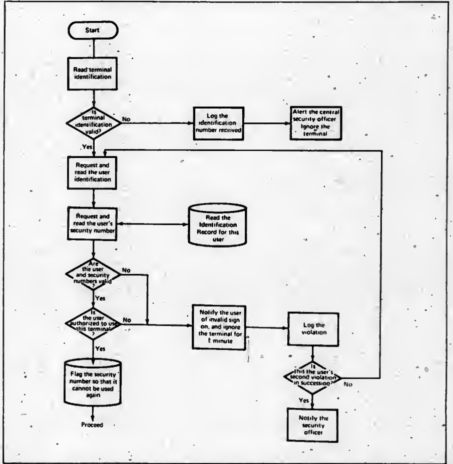
When it comes to computer fraud, data communications networks have special security problems apart from those afflicting isolated DP facilities.

In remotely accessible computer systems, the terminals may be teletypewriters, keyboard/displays, minicomputers or intelligent terminals, remote job entry stations or automated teller machines. Because they are the machines through which data is entered and output is received, they can be used to perpetrate computer fraud, and their physical security deserves consideration.

Access to a nelwork's terminals should be restricted whenever possible. It is especially important to restrict access to terminals that are used to access or update sensitive data files, data bases and programs.

Access to such terminals should be limited to people authorized to use the terminals. If certain terminals are designated for on-line program development only, they too should be secured against unauthorized use.

This article was adapted from a chapter of Computer Fraud and Countermeasures *(1979) by Krauss and MacGahan with permission of the publisher, Prentice-Hall, Inc. of Englewood Cliffs, N.J.*


Start
Read terminal identification
Is terminal identification valid?
No
Log the identification number received
Alert the central security officer Ignore the terminal
Yes
Request and read the user identification
Request and read the user's security number
Read the Identification Record for this user
Are the user and security numbers valid?
No
Yes
Is the user authorized to use this terminal?
No
Notify the user of invalid sign on, and ignore the terminal for 1 minute
Log the violation
Is this the user's second violation in succession?
No
Yes
Notify the security officer
Yes
Flag the security number so that it cannot be used again
Proceed

This depicts a sign-on using terminal identification validation and once-only security code. (The above chart is originally from James Martin's *1973 Security, Accuracy and Privacy in Computer Systems*, reproduced with the permission of Prentice-Hall, Inc.)

Lock and Key

The terminal may be equipped with a lock that, in the absence of the proper key, prevents its operation. Keys are provided only to authorized users of the terminals.

There are two problems with this: Keys may be lost, stolen or duplicated; and locks may be picked or bypassed. If a key is lost or stolen, or is suspected to have been duplicated, it may be necessary to rekey the lock and issue new keys to the authorized users.

With regard to picking or bypassing a terminal lock, many of the locks and installations we see can be readily defeated by an amateur locksmith. If one of your important fraud prevention measures relies on terminal locks, you would be well advised to get the opinion of a master locksmith on the extent to which the locks are manipulation-resistant.

Also, note whether electrical contacts on the terminal lock can be easily bypassed with a jumper wire, by opening the terminal cabinet or tilting the terminal on edge to expose its internal wiring.

As an alternative to the lock-and-key method, terminals may be equipped with magnetic card or badge readers. A legitimate card or badge must be inserted into the reader in order to activate the terminal. The cards or badges are distributed to authorized users only.

Terminal IDs

A terminal may have its own identification by which it is able to positively identify itself to the computer system. The security code for the terminal identification is generally hard-wired in the terminal.

This feature is important if the terminal is not in a secure location; if the terminal is used to access sensitive data files, data bases or programs; or if the communications network uses public dial-up or switching equipment — that is, anyone from anywhere can dial up the system.

The problem of positively identifying terminals is that, if a terminal should malfunction or break, another terminal cannot either replace it or be used in its place without a time delay.

Security codes for a particular terminal might be used to:

- Define the types of transactions and actions that can be performed using that terminal.
- Define the users authorized to use that terminal.
- Define the types of information that may be sent to that terminal.

The terminal security code might serve as a limiting factor in the sense that, if the user's authorization is greater than the terminal's, the user may be limited to using the terminal's authorization rather than his own.

The accompanying figure depicts a user sign-on in which the user is assigned a once-only security code. The terminal identification is used to identify the terminal and identify the users authorized to use it.

Communications lines, whether they are dial-up, leased or satellite or radio (terrestrial) microwave links, are vulnerable to penetration and interception. It is difficult, if not impossible, to physically secure communications lines. There are, however, steps that

(Continued on SR/30)

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ANN ARBOR

Real-Time Nets Less Reliable Than Batch Mode

By Robert V. Jacobson
Special to CW

A computer system that uses a big real-time network for data entry and inquiry is inherently less reliable, all other things being equal, than a traditional batch-mode system.

What is not obvious is how to optimize the reliability. Often one hears that reliability could be improved by having a dual CPU, dial-up backup, dual disks and so forth, but that the cost would be prohibitive.

This sort of "analysis" probably will not be accepted by senior managers much longer. Users are increasingly aware of the possibilities for backup and will not take kindly to being surprised — after the system is installed and there is no turning back — to learn that no backup exists and that they are exposed to catastrophic service interruptions.

Planning Ahead

We simply must plan ahead more effectively. All of the options must be considered, and the user must be educated as to the cost and performance of each potential backup mode.

At the same time, we should estimate the cost impact of each threat to reliable operation so that the optimum mixture of reliability measures can be included in the system configuration when the system is designed, rather than "tacked on" later,

Of course, after a system has been installed, audit and quality control persons must take all necessary steps to see that reliability standards included in the original design specifications are maintained.

Realistic tests should be a part of the normal operating plan. Surprise tests and inspections are needed to verify that all required backup facilities are in place.

Finally, it is important to review the original loss exposure estimates from time to time to be sure that new factors — such as increased traffic, new functions or a changed threat environment — have not altered the cost-benefit equation.

Constant Adjustment

The outstanding characteristic of the DP profession is the need to adjust, almost on a daily basis, to new technical and management developments. It is almost impossible to grasp how rapidly hardware has grown in capabilities while its cost and size have both shrunk.

System designers must constantly rethink the basic cost-performance assumptions they use. Systems that would have been far too expensive even five years ago are now quite feasible today.

As a result, business and government are making more and more use of DP, and the lines between the traditional centralized DP facility, distributed processing and data processing networks are becoming increasingly fuzzy.

New Challenges

This trend has created new challenges for people responsible for internal auditing, security and corporate asset protection. Twenty years ago, lines of responsibility in these three fields were fairly clear-cut, and potential loss exposures were generally recognized.

Now, the situation is much different. Loss exposures are not obvious and responsibilities are not well defined. Just when the audit profession had begun to deal effectively with the early, single-threat, sequential file computers of the 1960s, a host of new concepts have come into being.

Data communications is one such concept. It has led to some exposures that may not yet be fully recognized by users.

Likewise, security people may feel uncomfortable when confronted with a new, high technology system, which seems to present new crime opportunities. Like many of us, they are reluctant to venture into a new area where their ignorance of the technical details will be exposed.

Hence, security personnel may well turn aside with the hope that nothing will go wrong. Regrettably, a system designed without realistic "facts of life" crime-prevention capabilities (which security specialists could provide to users) may prove to be wide open to a successful embezzlement or theft.

(Continued on SR/17)

At the head table...

Successful data communications people know exactly who to look for when they need equipment. Before they evaluate products they evaluate manufacturers. They insist on a supplier who has the integrity and the resources to fully support his products. With a broad product range, and the technical expertise to continually develop and improve those products. That's why so many of the leading data communication users name Racal-Milgo as their first choice. And why you'll find Racal-Milgo equipment in so many of the world's largest, most sophisticated data communications systems...and in smaller systems on their way up.

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Paine Webber Thanks Diagnostic System

Wall Street Stockbroker Can't Afford Net Loss

By a CW Staff Writer

NEW YORK — In terms of operational impact, a stockbroker might put network breakdowns on a par with ruptures in a deep sea diver's air hose.

Because daily trading volumes exceed 50 million shares on the New York Stock Exchange, brokers must have confidence in the sophisticated data networks through which orders are placed, verified and executed. Paine, Webber, Jackson & Curtis, Inc. therefore considered bids from a number of data communications vendors when it recently upgraded its network's reliability and performance.

The brokerage firm, one of Wall Street's largest, considers its enhanced communications "an edge over the competition" as it prepares to merge with another big Wall Street name — Blyth, Eastman Dillon & Co., Inc.

Three Criteria

After recognizing the need for an on-line diagnostics system to support its network, Paine Webber decided that system had to meet three major criteria.

"With a network of our size, the day-to-day dependence on information availability is of prime importance," Donald E. Brown said. "The system had to be precise."

"In other words," Paine Webber's senior vice-president for computers and communications explained, "we needed the ability to isolate a fault, no matter whether it was with a line, a modem or a terminal.

The network "also had to utilize equipment that would not interfere with the mainstream data channel, and it had to be simple to operate — even by nontechnical people."

Date Base Applications

Paine Webber is reportedly the first firm to install a high-speed multidrop network with data base applications. The company presently runs an IBM 3032 with the vendor's Telecommunications Control System and Tcam under MVS.

An IBM 370/158 backs up the 3032 and two 3705 processors function as front-end systems; a third 3705 is on order. More than 600 interactive CRT terminals and 350 printers render I/O capabilities.

The network allows Paine Webber to disseminate information from its central data base in New York to the desks to individual brokers at any of the firm's 167 branch offices. Each day, more than 2,500 account executives submit thousands of client orders through the network.

"Using CRTs, our brokers can have instant access to account profiles, margin inquiry, trade inventories and research opinions," Brown stated. "This information helps them to fulfil their customers' requirements quickly and accurately."

On-Line Diagnostics

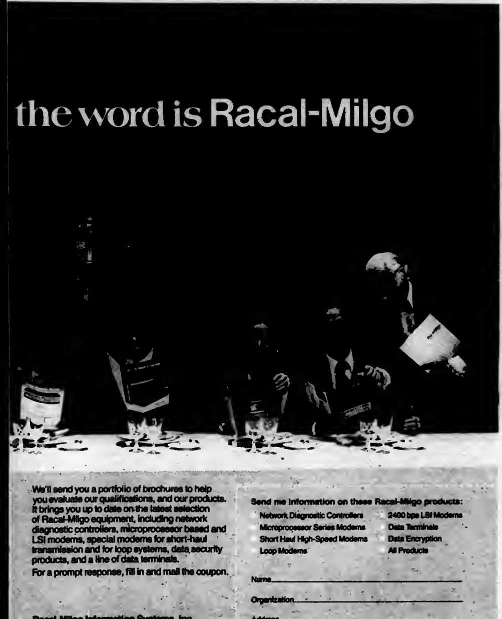
How serious is network reliability? "In the brokerage industry, uptime is critical," according to Data Communications Vice-President John Faccibene. "Even a minor delay in entering an order to buy or sell a security can lead to a major loss of dollars. We needed a vehicle that would allow us to quickly define and resolve a problem, without a lot of wasted time and effort."

After evaluating several major data communications vendors, Paine Webber chose Intertel, Inc. of Burlington, Mass. to implement on-line diagnostics. "We wanted a company that was totally involved with, and dedicated to, the concept of technical control," Faccibene said. "Intertel's only business is building on-line diagnostic test systems.

Fast Reporting

"In addition, its system was able to provide both the speed and functionality we were looking for. For example, it was able to scan our entire network and report any faults in less than five seconds."

(Continued on SR/23)



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CW

Steps to Internal Network Controls

By Dr. Jerry FitzGerald
Special to CW

The following controls and safeguards should be considered when reviewing the data communications network resources of an on-line system. This numerical listing describes each control.

It should be noted that implementation of various controls can be both costly and time-consuming. It is of great importance that a realistic and pragmatic evaluation be made with regard to the probability of a specific exposure affecting a specific asset. Only then can the control for safeguarding the asset be evaluated in a cost-effective manner.

The controls, as numerically listed in the cells of the matrix, are as follows:

1. Ensure that the system can switch messages destined for a down station/terminal to an alternate station/terminal.
2. Determine whether the system can perform message-switching to transmit messages between stations/terminals.
3. In order to avoid lost messages in a message-switching system, provide a store-and-forward capability. This is where a message destined for a busy station is stored at the central switch and then forwarded at a later time when the station is no longer bosy.
4. Review the message or transaction logging capabilities to reduce lost messages, provide for an audit trail, restrict messages, prohibit illegal messages and the like. These messages might be logged at the remote station (intelligent terminal), they might be logged at a remote concentrator/remote front-end processor or they might be logged at the central front-end communication processor/central computer.
5. Transmit messages promptly to redoce risk of loss.
6. Identify each message by the individual user's password, the terminal and the individual message sequence number.
7. Acknowledge the successful or unsucessful receipt of all messages.
8. Utilize physical security controls throughout the data communication network. This includes the use of locks, guards, badges, sensors, alarms and administrative measures to protect the physical facilities, data communication networks and related data communication equipment. These safeguards are required for access monitoring and control to protect data communication equipment and software from damage by accident, fire and environmental hazard, either intentional or unintentional.
9. Consider using modems that have either manual or remote actuated loopback switches for fault isolation to ensure the prompt identification of malfunctioning equipment. These are extremely important in order to increase the uptime and to identify faults.
10. Use front panel lights on modems to indicate if the circuit on line is functioning properly (carrier signal is up). This may not be a viable alternative with organizations that have hundreds of modems.
11. Consider a modem with alternate voice capabilities for quick troubleshooting between the central site and a major remote site.
12. When feasible, use digital data transmission, because it has a lower error rate than analog data transmission.
13. For data communication equipment, check the manufacturer's mean time between failures (MTBF) in order to insure that the data communication equipment has the largest MTBF.
14. Consider placing unused backup modems in critical areas of the data communication network.
15. Consider using modems that have an automatic or semiautomatic dial backup capability in case the leased line fails.
16. Review the maintenance contract and mean time to fix (MTTF) for all data communication equipment. Maintenance should be both fast and available. Determine from where the maintenance is dispatched, and determine if tests can be made from a remote site (for example, in many cases modems have remote loopback capabilities).
17. Increase data transmission efficiency. The faster the modem synchronization time, the lower will be the turnaround time and thus more throughput to the system.
18. Consider modems with automatic equalization (built in microprocessors for circuit equalization and balancing) in order to compensate for amplitude and phase distortions on the line. This will reduce the number of errors in transmission and may decrease the need for conditioned lines.
19. With regard to the efficiency of modems, review to see if they have multiple-speed switches so the transmission rate can be lowered when the line error rates are high.
20. Utilize four-wire circuits in a pseudo-full duplex transmission mode. In other words, keep the carrier wave up in each direction on alternate pairs of wires in order to reduce turnaround time and gain efficiency during transmission.
21. If needed, use full duplex transmission on two-wire circuits with special modems that split the frequencies and thus achieve full duplex transmission.
22. Increase the speed of transmission. The faster the speed of transmission by the modem, the more cost effective are the data communications, but error rates may increase with speed, and therefore you may need more error detection and correction facilities.
23. Utilize a reverse channel capability for control signals (supervisory) and to keep the carrier wave up in both directions.
24. Consider the following special controls on dial-up modems when the data communication network allows incoming dial-up connections: change the phone numbers at regular intervals; keep the phone numbers confidential; remove the phone numbers from the modems in the computer operations area.

    Also, require that each "dial-up terminal" have an electronic identification circuit chip to transmit its unique identification to the front-end communication processor; do not allow automatic call receipt and connection (always have a person intercept the call and make a verbal identification); have the central site call the various terminals that will be allowed connection to the system; utilize dial-out only where an incoming dialed call triggers an automatic dial-back to the caller (in this way the central system controls those phone numbers to which it will allow cunnection).
25. Physically trace out and, as well as possible, secure the local loop communication circuits or lines within the organization or facility. After these lines leave the facility and enter the public domain, they cannot be physically secured.
26. Consider conditioning the voice-grade circuits in order to reduce the number of errors during transmission (this may be unnecessary with the newer microprocessor-based modems that perform automatic equalization and balancing).
27. Use four-wire circuits in such a fashion that there is little to no turnaround time. This can be done by using two wires in each direction and keeping the carrier signal up.
28. Within an organizational facility, fiber optics (laser) communication circuits can be used so as to totally preclude the possibility of wiretapping.
29. Insure that there is adequate physical security at remote sites and especially for terminals, concentrators, multiplexers and front-end communication processors.
30. Determine whether the multiplexer, concentrator and remote front-end hardware have redundant logic and backup power supplies with automatic fallback capabilities in case the hardware fails. This will increase the uptime of many stations/terminals that might be connected to this equipment.
31. Consider logging inbound and outbound messages at the remote site.
32. Consider uninterruptible power supplies at large moltiplexor/concentrator type remote sites.
33. Consider multiplexor/concentrator equipment that has diagnostic lights, diagnostic capabilities and the like.
34. If a concentrator is being used, is it performing some of the controls that are usually performed by the front-end communication processor and therefore increasing the efficiency and correctness of data transmissions?
35. See if the polling configuration list can be changed during the day in order to exclude or include specific terminals. This would allow the positive exclusion of a terminal as well as allow various terminals to come on-line and off-line during the working day.
36. Can the front-ends, concentrators, modems and the like handle the automatic answering and automatic outward dialing of calls? This would increase the efficiency and accuracy when it is preprogrammed into the system.
37. Ensure that all inbound and outbound messages are logged by the central processor, the front-end or remote concentrator in order to insure against lost messages, keep track of message sequence numbers (identify illegal messages) and to use for system restart should the entire system crash.
38. For efficiency, ensure that the central system can address either a group of terminals (group address), several terminals at a time (multiple address), one terminal at a time (single address) or send a broadcast message simultaneously to all stations/terminals in the system.
39. See that each inbound and outbound message is serial numbered as well as time-and-date stamped at the time of logging.
40. Ensure that there is a "time out" facility so the system does not get hung up trying to poll/address a station. Also, if a particular station "times out" four or five consecutive times, it should be removed from the network configuration polling list so time is not wasted on this station and communication efficiency is improved.
41. Considet having concentrators and front-ends perform two levels of editing. In the first level, the front-end may add items to a message, reroute the message or rearrange the data for further transmission. It may also check a message address for accuracy and perform parity checks.

    In the second level of editing, the concentrator or front-end is programmed to perform specific edits of the different transactions that enter the system. This editing is an application system type of editing that deals with message content rather than form and is specific to each application program being executed.
42. Have the concentrators, front-ends and central computers handle the message priority system, if one exists. A priority system is set up to permit a higher line utilization to certain areas of the network or to ensure that certain transactions are handled before other transactions of lesser importance.
43. See that the front-end collects message traffic statistics and performs correlations of traffic density and circuit availability. These

(Continued on SR/8)

CONCERNS / EXPOSURES

RESOURCES / ASSETS

	ERRORS AND OMISSIONS	MESSAGE LOSS OR CHANGE	DISASTERS AND DISRUPTIONS	PRIVACY	SECURITY/ THEFT	RELIABILITY (UP-TIME)	RECOVERY AND RESTART	ERROR HANDLING	DATA VALIDATION AND CHECKING	
CENTRAL SYSTEM	1-4, 7, 39, 41-43, 47, 48	1-5, 7, 37, 69, 68, 69, 65	1, 5, 11, 13, 16, 29, 40, 48, 50, 51, 54, 57, 58, 60, 65, 76, 69	6, 6, 24, 35, 53, 58, 60, 62, 68, 70, 72-74, 78-80	6, 6, 24, 69, 53, 56, 60, 62, 64, 70, 72-74, 77-80	1, 13, 16, 29, 36, 40, 60, 51, 63-65, 69, 51, 60	60, 51, 63-65, 68	69, 65, 69	6, 24, 26, 41, 47, 60	
SOFTWARE	1-4, 7, 39, 41-43, 68-49, 52	1-5, 7, 37, 60, 41, 42, 46, 49, 52, 54, 60	1, 8, 16, 40, 60, 50-54, 57-69, 63, 65	6, 5, 24, 35, 53, 60, 60, 62, 68, 70, 72-74, 78-80	5, 8, 24, 69, 60, 53, 60, 60, 62, 60, 70, 72-74, 78-80	1, 60, 40, 60, 51, 56-59, 61, 63, 60, 60	50-52, 61, 63, 64, 68	60, 61, 69, 60	5, 24, 39, 41, 47-49, 52, 53, 55, 60, 60	
FRONT END COMMUNICATION PROCESSOR	1-4, 7, 38, 39, 41-44, 46-48	1-5, 7, 36, 37, 39, 41, 42, 60, 60	1, 6, 13, 16, 29, 60, 64, 48, 60, 51, 54, 57, 60, 60, 65, 70, 85	6, 6, 24, 35, 37, 45, 65, 62, 60, 70, 72-74, 78-80	6, 6, 24, 29, 35, 37, 39, 69, 60, 62, 60, 70, 72-74, 78-80	1, 13, 16, 29, 60, 24, 60, 60, 43, 44, 50, 51, 63-65, 81, 60	37, 60, 51, 63-65	43, 60, 60, 69	6, 24, 69, 41, 45, 47, 48, 60	
MULTIPLEXER, CONCENTRATOR SWITCH	1-4, 7, 37, 60, 41, 64, 46, 47	1-5, 7, 37, 39, 41, 42, 46, 69	1, 8, 13, 16, 29, 60, 32, 33, 60, 44, 60, 50, 51, 54, 57, 60, 65, 76, 69	6, 6, 24, 25, 37, 69, 60, 62, 60, 70, 72-74, 78-80	6, 6, 24, 69, 35, 37, 39, 69, 60, 62, 60, 70, 72-74, 78-80	1, 13, 16, 69, 60, 32-34, 36, 40, 64, 60, 61, 63-65, 61, 60	37, 50, 51, 63, 60	60, 85, 88	6, 24, 69, 41, 60, 47, 68, 88	
COMMUNICATION CIRCUITS (LINES)	12, 26	26, 70, 61	10, 15, 16, 16, 26, 63, 60, 60, 75, 76, 79, 91	25, 60, 60, 70, 75, 76, 78-80, 91	25, 60, 68, 70, 76, 79, 78-80, 91	15, 16, 20, 21, 23, 60, 37, 63, 64, 66-68, 60	63, 60, 66, 60	85		
LOCAL LOOP	12	29	29, 75, 69	25, 76	25, 69, 76, 76	60, 60	63, 60, 60	69		
MODEMS	12, 18	18, 24	8-11, 13-14, 15	24	24, 29	8-11, 13-18, 20, 21, 23, 60, 60	8-11, 14, 15, 63, 60	18-20, 33, 23		
PEOPLE	5, 26	6, 7, 31, 26, 70	79-87	6, 6, 24, 62, 69-71, 74, 77, 76, 80	5, 8, 26, 29, 53, 69-71, 74, 77, 79, 80	51, 82, 85-87	66, 51, 60, 87	60, 86, 87, 88, 90	6, 86	
TERMINALS/ DISTRIBUTED INTELLIGENCE		2		6, 6, 24, 69, 53, 60, 62, 70	6, 8, 24, 29, 45, 53, 60, 62, 70	1, 60, 88	63, 64		6, 24, 69	

Data Communications Control Matrix

Matrix Illustrates 91 Internal Network Controls

By Dr. Jerry FitzGerald
Special to CW

The internal control area to be reviewed using the matrix approach covers the data communication links between the computer and input/output terminals. These data communication-oriented controls may involve hardware controls, software controls and personnel controls.

When reviewing the data communication controls, match each resource/-asset with its corresponding concern/-exposure as listed in the Data Communications Control Matrix. This matrix lists the resources' relation to the potential exposures and cross-relates these with the various controls/safeguards that should be considered when reviewing the data communication controls.

Immediately following is a definition of each of the concerns/exposures that are listed across the top of the matrix and each of the resources/assets that are listed down the left vertical column of the matrix.

The following concerns/exposures are those that are directly applicable to the data communication network review of an on-line system. The definition for each of these exposures, listed across the top of the matrix, is as follows:

- *Errors and Omissions:* The accidental or intentional transmission of data that is in error, including the accidental or intentional omission of data that should have been entered or transmitted on the on-line system.
- *Message Loss or Change:* The loss of messages as they are transmitted throughout the data communication system, or the accidental or intentional changing of messages during transmission.
- *Disasters and Disruptions (natural and man-made):* The temporary or long-term disruption of normal data communication capabilities.
- *Privacy:* The accidental or intentional release of data about an individual, assuming that the release of this personal information was improper to the normal conduct of the business at the organization.
- *Security/Theft:* The security or theft of information that should have been kept confidential because of its proprietary nature.
- *Reliability (Uptime):* The reliability of the data communication network and its "up time." This includes the organization's ability to keep the data communication network operating and the mean time between failures (MTBF) as well as the time to repair equipment when it malfunctions.
- *Recovery and Restart:* The recovery and restart capabilities of the data communication network, should it fail. In other words, how does the software operate in a failure mode? How long does it take to recover from a failure?
- *Error Handling:* The methodologies and controls for handling errors at a remote distributed site or at the centralized computer site. The object here is to insure that when errors are discovered, they are promptly corrected and reentered into the system for processing.
- *Data Validation and Checking:* The validation of data either at the time of transmission or during transmission. The validation may take place at a remote site (intelligent terminal), at the central site (front-end communication processor) or at a distributed intelligence site (concentrator or remote front-end communication processor).

The following resources/assets are those that should be reviewed during the data communication control review. The definition for each of these assets, listed down the left vertical column of the matrix, is as follows:

- *Central System:* Most prevalent in the form of a central computer to which the data communication network transmits and from which it receives information. In a distributed system, with equal processing at each distributed node, there might not be an identifiable central system (just some other equal-sized distributed computer).
- *Software:* The software programs that operate the data communication network. These programs may reside in the central computer, a distributed-system computer, the front-end communication processor, a remote concentrator or statistical multiplexer and/or a remote intelligent terminal.
- *Front-End Communication Processor:* A hardware device that interconnects all the data communication circuits (lines) to the central computer or distributed computers and performs a subset of the following functions: code and speed conversion, protocol, error detection and correction, format

(Continued on SR/8)

The "Data Communication Control Matrix" and accompanying articles are taken with the author's permission from Internal Controls for Computerized Systems, *a book available for $9.95 plus $1.20 postage and handling from Jerry FitzGerald & Associates, 506 Barkentine Lane, Redwood City, Calif. 94065. (California residents should add 6% sales tax.)*

Matrix Illustrates 91 Internal Network Controls

(Continued from SR/7)

checking, authentication, data validation, statistical data gathering, polling/addressing, insertion/deletion of line control codes and the like.

- *Multiplexer, Concentrator, Switch:* Hardware devices that enable the data communication network to operate in the most efficient manner.
- *Communication Circuits (Lines):* The common-carrier facilities used as links (a link is the interconnection of any two stations/terminals) to interconnect the organization's stations/-terminals.
- *Local Loop:* The communication facility between the customer's premises and the telephone company's central office or the central office of any other special common carrier.
- *Modems:* A hardware device used for the conversion of data signals from terminals (digital signal) to an electrical form (analog signal) which is acceptable for transmission over the communication circuits that are owned and maintained by the telephone company or other special common carrier.
- *People:* The individuals responsible for inputting data, operating and maintaining the data communication network equipment, writing the software programs for the data communications, managing the overall data communication network and those involved at the remote stations/terminals.
- *Terminals/Distributed Intelligence:* Any or all of the input or output devices used to interconnect with the on-line data communication network.

FitzGerald is a principal in Jerry FitzGerald and Associates, a management consulting firm located in Redwood City, Calif.

Internal Net Controls

(Continued from SR/6)

analyses are mandatory for the effective management of a large data communication network. Some of the items included in a traffic density report might be the number of messages handled per hour or per day on each link of the network, the number of errors encountered per hour or per day, the number of errors encountered per program or per program module and the terminals or stations that appear to have a higher than average error record.

44. Ensure that the front-ends and concentrators can perform miscellaneous functions such as triggering remote alarms if certain parameters are exceeded, performing multiplexing operations internally, signaling abnormal occurrences to the central computer and slowing up input/output messages when the central computer is overburdened due to heavy traffic.

45. Ensure that the concentrators and front-ends can validate electronic terminal identification.

46. Ensure that there is a message-intercept function for inoperable terminals or invalid terminal addresses.

47. See that messages are checked for valid destination address.

48. Ensure adequate error detection and control capabilities. These might include echo-checking, where a message is transmitted to a remote site and the remote site echoes the message back for verification, or it might include forward error correction, where special hardware boxes can automatically correct some errors upon receipt of the message, or it might include detection with retransmission.

    Detection with retransmission is the most common and cost-effective form of error detection and correction. This may include identification of errors by reviewing the parity bit or utilizing a special code to identify errors in individual characters during transmission. A more prevalent form is to utilize a polynomial (mathematical algorithm) to detect errors in message blocks. Whichever way is used, when a message error is detected, it is retransmitted until it is received correctly.

49. When reviewing error detection in transmission, first determine whatever error rate can be tolerated, then determine the extent and pattern of errors on the communication links used by the organization, and then review the error detection and correction methodologies in use and determine if they are adequate for the application systems utilizing the data communication network. In other words, a purely administrative message network (no critical financial data) would not require error detection and correction capabilities equal to a network that transmits critical financial data.

50. Ensure that there are adequate restart and recovery software routines to recover from items such as a trapped machine check, where instead of bringing down the entire data communications system, a quick recovery can be made and

(Continued on SR/10)

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 users' companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.56 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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Reality by Microdata

Keeps Out Unauthorized Accessers

School Net Enrolls Intelligent Port Selector

By Jay Woodruff
CW Staff

FALLS CHURCH, Va. — A school district here in the greater Washington, D.C., area has bolstered the security and improved the performance of its four-processor network — without raising costs — by installing an intelligent port selector and data concentrators.

The Fairfax County School District, reportedly the 11th largest in the U.S., operates an extensive on-line network that allows students in its 23 high schools to gain access to three minicomputers and one mainframe.

However, these systems were easily accessible over the phone by students from colleges and schools not eligible to use them because they could obtain a valid identification code from a friend in one of the county schools.

This created a security problem: The mainframe — an IBM 370/155 — is located at the County Building and also contains government data and applications.

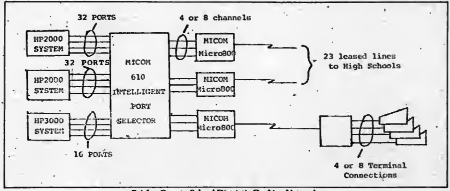
Most of the approximately 2,600 students use the three minicomputers for their work. They are a Hewlett-Packard Co. 3000 — with 128K bytes of memory — and a pair of HP 2000 systems, each with a 64K-byte processor and a 48K-byte I/O processor.

The IBM system is used by students submitting 200 jobs a day for advanced projects that lay outside the capabilities of the minicomputers, according to Marv Koontz, Fairfax County's computer coordinator.

Access Limited

With the delivery of a Micom Systems, Inc. 610 intelligent port selector and 23 pairs of Micom Micro800 data concentrators — one pair for each of the high schools — the district effectively closed the door to outside use of the computers.

Meanwhile, the county high school students can continue to gain access to the systems from any terminal, according to Koontz. The coordinator called the configuratioon, which has been in place since December of last year, "a pretty secure method that no one can sneak by to get resources they shouldn't have."



Fairfax County School District's On-Line Network

Fairfax County School District had two other problems that were solved by the Micom gear. For one thing, it could not afford to increase terminal speeds from 30- to 120 char./sec because of the high cost of upgrading to 1,200 bit/sec full-duplex, dial-up modems.

In addition, message unit costs and long distance dial charges were often double and triple the costs budgeted for the dial-up system.

Extra Speed

To eliminate the first problem, the Micro800 data concentrators have provided the extra speed for which users were pressing. The integral 1,800 bit/sec modems "allow us to operate all our terminals at 1,200 bit/sec, instead of limiting two-thirds of them to 300 bit/sec as we had originally expected," Koontz said.

And the cost of the additional capabilities, when amortized over a five-year period, is no greater than the cost of the dial-up system it replaced. Transmission errors are also eliminated because of the data concentrators' built-in retransmission feature, Koontz added.

To submit a job to the IBM system, a student writes the source code of a particular programming language in a basic formatted file into an HP 2000. Software transmits these files via a remote job entry line to the mainframe.

Source files are then submitted as a job through a JCL. After running the jobs on the 370 at any idle time of the day or night, they are turned around back through the system through files named by the student with his ID.

Although the school district had to wait a bit longer for the 610 than it wanted, the unit was uniquely close to the kind of port selector the district needed. "In January 1978, we had pretty much defined what we wanted and gave the technical specifications to

(Continued on SR/28)

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Steps to Internal Network Controls Outlined

(Continued from SR/8)

only the one transmission need be transmitted.

51. Ensure that there are adequate restart and recovery procedures to effect both a warm start and a cold start. In other words, a data communication system should never completely fail so the user hss to perform a cold start (start up as if it is a new day, all message counters cleared). The system should go into a warm start procedure, where only parta of the system are disabled and recovery can be made while the system is operating in a degraded mode.

52. Ensure that there is an audit trail logging facility to assist in the reconstruction of data files and the reconstruction of transactions from the various stations. There should be the capability to trace back to the terminal and user.

53. Provide some tables for checking for access by terminals, people, data base and programs. These tables should be in protected areas of memory.

54. Safe-store all messages. All transactions and messages should be protected in case of a disastrous situation, such as power failure.

55. Protect against concurrent file updates. If the data management software does not provide this protection, the data communication software should.

56. For convenience, flexibility and security, ensure that terminals can be brought up or down dynamically while the system is running.

57. Make available a systems trace capability to assist in locating problems.

58. Ensure that the documentation of the system software is comprehensive.

59. Provide adequate maintenance for the software programs.

60. Ensure that the system supports password protection (multilevel password protection).

61. Identify all default options in the software and their impact if they do not operate properly.

62. For entering sensitive or critical systems commands, restrict these commands to one master input terminal and ensure strict physical custody over this terminal. In other words; restrict those personnel who can use this terminal.

63. Ensure that there are adequate recovery facilities and/or capabilities for a software failure, loss of key pieces of hardware and loss of various communications circuits or lines.

64. Ensure that there are adequate backup facilities (local and remote) to back up key pieces of hardware and communication circuita or lines.

65. Consider backup power capabilities for large facilities such as the central site and various remote concentrators.

66. Consider installing the capabilities to fall back to the public dial network from a leased line configuration.

67. When utilizing multidrop or loop circuits, review the uptime problems. These types of configurations are more cost-effective than point-to-point configurations, but when there is a circuit failure close to the central site, all terminals/-stations downline are disconnected.

68. Review the physical security (local and remote) for circuita and lines (especially the local loop), hardware/software, physical facilities, storage media and the like.

69. For personnel that work in critical or sensitive areas, consider enforcing the following policies: insist that they take at least five consecutive days of vacation per year, check with their previous employers, perform an annual credit check and have them sign hiring agreementa stating that they will not sell programs.

70. With regard to data security, consider encrypting all messages transmitted.

71. Develop an overall organizational security policy for the data communication network. This policy should specifically cover the security and privacy of information.

72. Ensure that all sensitive communication programs and data are stored in protected areas of memory or disk storage.

73. Ensure that all communication programs or data, when they are off-line, are stored in areas with adequate physical security.

74. Ensure that all communication programs and data are adequately controlled when they are transferred to microfiche.

75. Lock up phone equipment rooms and install alarms on the doors of those phone equipment rooms that contain the basic data communication circuits.

76. Do not put communication lines through the public switchboard unless it is a new electronic switchboard (ESS) and the intent is to gain verbal identification of incoming dial-up communication calls.

77. Review the communication system's console log that shows "network supervisor terminal commands" such as: disable or enable a line or station for input or output, alternately route traffic from one station to another, or change the order and/or frequency of line or terminal service (polling, calling, dialing).

78. Consider packet-switching networks that use alternate routes for different packets of information from the same message; this would offer a form of security in case someone were intercepting messages.

79. Ensure that there is a policy for the use of test equipment. Modern-day test equipment may offer a new vulnerability to the organization. This test equipment is easily connected to communication lines, and all messages can be read in clear "English language."

Test equipment should not be used for monitoring lines "for fun"; it should be locked up (key lock or locked hood) when it is not in use and after normal working hours when it is not needed for testing and debugging; programs written for programmable test equipment should be kept locked up and out of the hands of those who do not need these programs.

80. Review the operational procedures, for example, the administrative regulations, policies and day-to-day activities supporting the security safeguards of the data communication network. These procedures may include:

- Specifying the objectives of the DP security for an organization, especially as they relate to data communications.
- Planning for contingencies of security "eventa," including recording of all exception conditions and activities.
- Assuring management that other safeguards are implemented, maintained and audited, including background checks, security clearances and hiring of people with adequate security-oriented characteristics; separation of duties; mandatory vacations.
- Developing effective safeguards for deterring, detecting, preventing and correcting undesirable security events.
- Reviewing the cost-effectiveness of the system and the related benefits such as better efficiency, improved reliability and economy.
- Looking for existence of current administrative regulations, security plans, contingency plans, risk analyses, personnel understanding of management objectives and then reviewing the adequacy and timeliness of the specified procedures in satisfying these.

81. Review the preventive maintenance and scheduled diagnostic testing such as clesning, replacement and inspection of equipment to evaluate its accuracy, reliability and integrity. This may include schedules for testing and repair, adequate testing of software program changes submitted by the vendor, inventories of replacement parta (circuit boards) and past maintenance records.

82. Determine whether there is a central site for reporting all problems encountered in the data communication network. This usually results in faster repair time.

83. Review the financial protection afforded from insurance for various hardware, software and data stored on magnetic media.

84. Review the legal contracts with regard to the agreementa for performing a specific service and a specific costing basis for the data communication network hardware and software. These might include bonding of employees, conflict of interest agreements, clearances, nondisclosure agreementa, agreements establishing liability for specific security events by vendors and agreements by vendors not to perform certain acts that would incur a penalty and the like.

85. Review the organization's fault isolation diagnostics, including the techniques used to ascertain the integrity of the various hardware and software componenta comprising the total data communication entity. These techniques are used to audit, review and control the total data communication environment and to isolate the offending elementa either on a periodic basis or upon detection of a failure. These techniques may include diagnostic software routines, electrical loopback, test message generation and administrative and personnel procedures.

86. Review the training and education of employees with regard to the data communication network. Employees must be adequately trained in this area because of the high technical competence required for data communication networks.

87. Ensure that there is adequate documentation, including a precise description of programs, hardware, system configurations and procedures intended to assist in the prevention of problems, identification of problems and recovery from problems. The documentation should be sufficiently detailed to assist in reconstructing the system from its parts.

88. Review the techniques for testing used to vslidate the hardware and software operation to ensure integrity. Testing, including that of personnel, should uncover departures from the specified operation.

89. Review error recording to reduce lost messages. All errors in transmission of messages in the system should be logged, and this log should include the type of error, the time and date, the terminal, the circuit, the terminal operator and the number of times the message was retransmitted before it was correctly received.

90. Review the error correction procedures. A user's manual should specify a cross-reference of error messages to the appropriate error code generated by the system. These messages help the user interpret the error that has occurred and suggest the corrective action to be taken. Ensure that the errors are in fact corrected and the correct data reentered into the system.

91. Consider backing up key circuits or lines. This circuit backup may take the form of a second leased line, modems that hsve the ability to go to the public dial-up network when a leased line fails or manual procedures where the remote stations can transmit verbal messages using the public dial-up network.

INTRODUCING PARADYNE'S RESPONSE...

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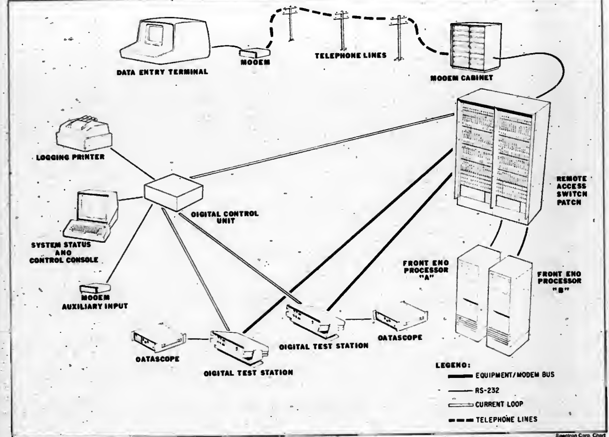

Spectron Corp. Chart

Rasp System Configuration

Network Management Evolution Leads to Rasp

Special to CW

The objective of network management systems is to minimize system downtime.

The means to achieve this objective has taken many forms. Initially, network management was handled by on-site personnel who would nervously swap cables from suspect to stand-by network components in an often frantic effort to restore a malfunction line.

This was both tedious and time-consuming. Moreover, technicians would spend countless hours tracing data lines only to find an error early in the search had led them down a false trail.

This subjected the cables to possible damage and mixup through repeated insertions of connectors in various sockets. It also required that spares be available for every site. Larger organizations often divided spares between several sites in a territory and then swapped equipment between the sites as required.

Technical Control Centers

As communications networks grew in complexity, technical control centers — the first efficient approach to network management — were developed to better organize the maze of cables and data lines forming the lifeblood of many businesses.

By bringing all the lines to a central location and providing test access to each of those lines, the technical control center not only provided a necessary means of network management, but also formed the nucleus for future system expansions.

The magnetic reed switch allowed communications technology to make its greatest stride forward in this area. A very reliable form of switching, the magnetic reed switch is formed from a pair of ferromagnetic reeds hermetically sealed in a controlled atmosphere glass tube. They are unaffected by dust, corrosion or oxidation.

> *'A large network with many installations often requires management capability at each site plus the capability to manage or at least oversee operation of the entire network. This calls for a technique known as remote access switching and patching (Rasp), which represents the state of the art in network management.'*

A-B Switch

The basic technical control element using magnetic reed switches is the A-B switch, which was designed to permit electrical connection of a single input to either of two outputs, known as "A" or "B."

The A-B switch is a bidirectional device and may be used singly or in combination with other switches to provide elaborate combinations for unique system backup configurations.

But users quickly discovered a limitation with the basic A-B switch. For sites with more than just a few lines, the number of A-B switches needed by one site to back up a given number of applications became too expensive and too difficult to manage.

Digital Patch Unit

This problem led to development of the digital patch unit (DPU), a device constructed of high-reliability magnetic reed switches activated upon insertion of patch cord. DPUs were intended to meet the same basic goals addressed by A-B switches, but with more versatility and ease of use.

The patch cord insertion opens the DPU circuit and transfers all its signals to the patch cord whose other end is inserted in another DPU. Hence, an alternate path is introduced, by passing selected network components.

Digital Switch Patch

Users soon realized that the combination of an A-B switch with digital patch capability would greatly benefit the network management center. "Gang switching," the addition of solenoids to permit A-B switching on a group basis, produced the digital switch patch (DSP) unit.

For example, one vendor's DSP provides A-B switching capability to rearrange network components and accessing capability to monitor the active circuit and test off-line components.

Virtually any size and complexity of data communications system can be managed with state-of-the-art DPUs and DSPs and a complement of interactive analyzers and line monitors. But this control can only be exercised by someone physically located at the places where those devices are installed

State of the Art

A large network with many installations often requires management capability at each site plus the capability to manage or at least oversee operation of the entire network. This calls for a technique known as remote access switching and patching (Rasp) which represents the state of the art in network management.

Rasp allows a user to perform all required control and management tasks from a single central site away from the main computer system. Thus, network management is not limited to on-site installations with only voice communication between sites. Rasp gives unlimited flexibility for rearranging network components and for monitoring traffic and conducting interactive tests.

Produced in both analog and digital

(Continued on SR/26)

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Small Networks Gain Big Nets' Functionality

(Continued from SR/2)

- High-speed data transfers.
- Good system availability and reliability.

In contrast, data transmission networks presented:

- Poor integrity (very high bit error rates).
- Very low-speed data transfers.
- Poor availability and reliability (high frequency of line outages).

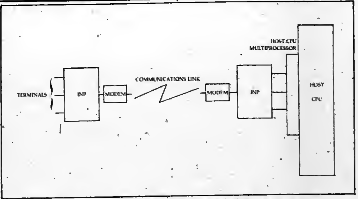
Tripartite Development

The hardware and software mechanisms necessary to reconcile these differences were developed at three levels in the data communications network. At the terminal level, techniques included buffered operation, elaborate communications protocols and intelligent terminal functionality.

But the implementation cost was quite high at the terminal level because of the multiplier effect of the large numbers of terminals.

At the network processor level, additional capabilities intended to improve reliability and integrity included error checking, retransmission techniques, network statistics gathering, alternate routing mechanisms and methods of network control.

The network processors were generally based on minicomputers and appeared under a number of different names, including "remote message concentrator," "network management system" and "terminal cluster controller."



The design of an INP is based on single or multiple microprocessors.

The cost of reliability and integrity solutions at the network processor level was very high and cost-effective only for large networks.

Finally, the host CPU level was also required to commit resources in the form of elaborate teleprocessing monitors with retry mechanisms, password control, extensive network statistics and centralized configuration control. The cost of implementing the reliability and integrity functions in large hierarchical networks was easily justified.

Small Networks

More recently, minicomputers and distributed processing systems have become popular with network users. This trend has created many small to medium-sized terminal networks.

In most cases, such networks have not been implemented with the large network level of functionality to support reliability and integrity. However, smaller users need this functionality just as larger users do.

The reasons why smaller network users have not emphasized reliability and integrity as much as larger users include:

- *Cost justification.* In large networks, reliability/integrity mechanisms are expensive relative to the cost of host processors; hence, the mechanisms represent a substantial investment in smaller networks. For example, remote concentrators may cost $60,000 to $70,000.
- *Limited functionality of minicomputer and small system software offerings.* Most mini vendors provide scant or primitive functionality in network operating system management, network statistics or centralized control of network parameters. Moreover, the system resources available for this activity are limited in such areas as memory size and CPU bandwidth.
- *Scarcity of data communications technical personnel.* Most small and medium-sized networks cannot justify the staffing necessary to define, design and implement this advanced network functionality.

A lack of dedicated expertise also handicaps the operation and maintenance of such networks.

Solution Now Available

A solution is now available to users of smaller networks that features the long-missing large network functionality necessary to ensure reliability and integrity.

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(Continued on SR/28)

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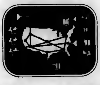

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Real-Time Nets Not as Reliable as Batch Mode

(Continued from SR/4)

There is no question about the vulnerability of network data to unauthorized disclosure. The compactness of magnetic media and the ease and speed with which they can be duplicated were recognized as important factors in the early days of DP.

But we have apparently not made much headway in dealing with fairly simple exposures — judging from several recent incidents here and in Europe. Nonetheless, there seems to be a tendency among DP people to think "it won't happen here."

A technical manual dealing with one access control system made the observation that "99% of programmers are honest all of the time, and the other one percent are honest 99% of the time." Experienced security and law enforcement people universally reject such "statistics" as utterly unrealistic.

The system designer who uses them as the basis for planning a system to control assets or information is probably in for a nasty surprise.

Designing Controls

There are several significant exposures to disclosure that should be carefully considered when designing controls. First of all, it is often very easy to get data by simply stealing the medium on which it has been recorded.

While even standard 10-in. tape reels are easy enough to steal, diskettes and floppy disks must be an absolute delight to industrial spies. Unencrypted data circuits make ideal wire-tapping targets.

But there is no need to listen to endless hours of nonsense to get the target information. Instead, a simple computer program can search for occurrences of key words — 1981 product plan, drug XYZ test results, product ABC market share and so on — and produce neatly printed listings of the pertinent messages with time, date and source heading labels.

Much of the exposures can be prevented easily by using cryptographic hardware and competent encryption key management. Since messages will be "in the clear" at remote terminals, it is important to consider the exposure to electromagnetic and acoustic emanations.

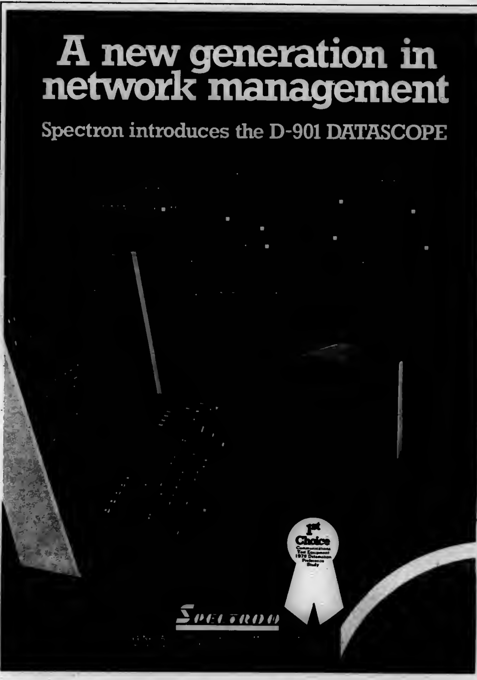
The rule of thumb is that, in most cases, the interception equipment must be located within 200 ft of the target terminal if it is to be inconspicuous.

Finally, it is worth considering exposure to simple eyeball observation. If the industrial spy can see the data of interest — for example, an important transaction code or master password — he is hardly likely to resort to wiretapping or laser ranging on the terminal room window to pick up printer sounds.

If the potential loss exposure justifies spending thousands of dollars to install cryptographic equipment, it is probably worthwhile to buy a few paper shredders as well.

A final word of caution: The intruder will seek out and attack the weakest link in the system's defense. Don't fall into the "iron doors in paper walls" trap.

Jacobson is president of International Security Technology, Inc. in New York. He was the principal author of "Guidelines for Automatic Data Processing Physical Security and Risk Management," adopted by the National Bureau of Standards as Federal Information Processing Standard No. 31.



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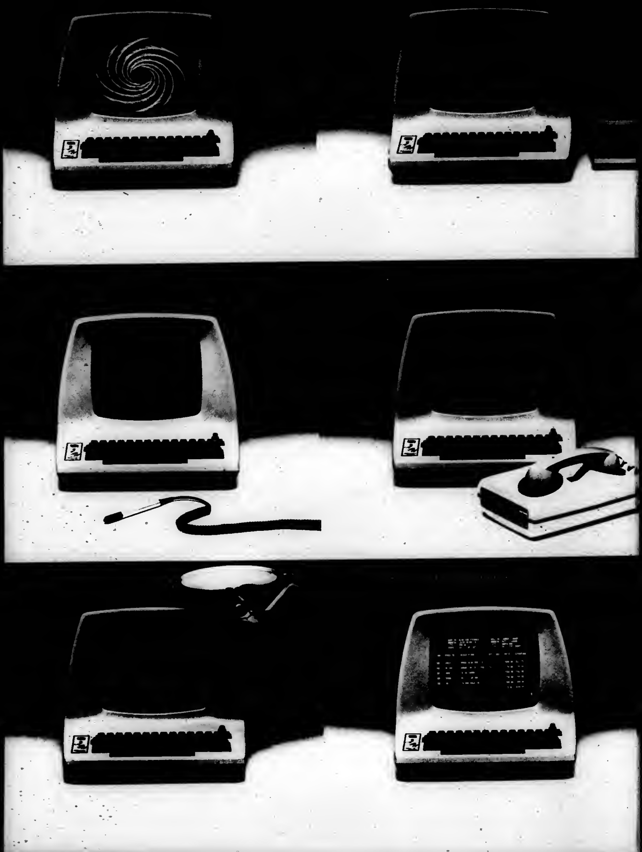

What could anyone possibly do with 85,000 Dumb Terminals?

That's how many ADM-3A's there are out in the field working right now. And more being shipped each day. Now just what accounts for such remarkable popularity?

Sure, it's the definitive dumb terminal, adaptable enough to fit a host of applications. It has a 12-inch diagonal screen. Full or half duplex operation at 11 selectable data rates. 1920 easy-to-read characters in 24 rows of 80 letters. 59 entry keys. An RS232C interface extension port. And direct cursor addressing.

But we wondered if all 85,000 Dumb Terminals were being used for just everyday data entry. So we checked around.

And found that people are using Dumb Terminals for things even we never thought of.

THE ADM-3A GOES INTO BUSINESS.

More and more OEM's are putting the Dumb Terminal into small business systems. They assemble a package that usually contains a disk, memory, a printer, and a video display terminal—the adaptable ADM-3A.

So the chances are that when you buy a small business system from someone, it'll contain, you guessed it, the amazing Dumb Terminal.

IT TAKES STOCK OF THE SITUATION.

Many businesses are using the Dumb Terminal, along with a light pen (Universal Product Code Decoder), to keep track of their inventory. The decoder is interfaced to the Dumb Terminal, and when a piece of merchandise imprinted with a Universal Product Code passes under it, the item is entered into a computer for tallying.

Simultaneously, the item is also displayed on the ADM-3A's screen—so it's instantly available for quick double-checking.

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Surprisingly enough, many computer programmers use the ADM-3A as an effective, portable I/O device. They can take it into a back room or, along with an acoustic coupler, to their homes if they wish, and compile programs nearly anywhere.

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We discovered that many computer buffs are using the Dumb Terminal as an inexpensive way to upgrade their systems. After all, the equipment found on most microcomputers leaves a lot to be desired. Such as the tiny five or six-inch screen, for instance.

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In fact, the ADM-3A is compatible with just about any RS232 device you can name. Even other video terminals, if you wish.

And people call this a "dumb" terminal?

WHAT WILL THEY THINK OF NEXT?

Who knows? But it seems that as long as there are Dumb Terminals, people will find new, unsuspected uses for them.

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Cryptography Provides Practical Data Security . . .

By Carl H. Meyer,
Richard Lennon
And Stephen M. Matyas
Special to CW

Interest in cryptography — the transforming of data (plaintext), either stored or transmitted, into cryptograms (ciphertext) — increased when the National Bureau of Standards (NBS) began searching in 1973 for a universally applicable cryptographic procedure for data processing systems.

The procedure had to withstand intense cryptanalysis — the techniques used by antagonists to recover the original information. Finally, in 1977, after careful consideration and exhaustive testing, the NBS approved a technique submitted by IBM as the Data Encryption Standard (DES). Since then, numerous manufacturers have had the bureau validate their hardware implementations of the DES.

One method of applying cryptography is with cipher systems, which require two basic elements: a cryptographic algorithm, or set of constant rules, and a set of variable cryptographic keys.

The algorithm, an extremely large number of transformations, defines how intelligible data (plaintext) is changed into apparent random noise (ciphertext). Individual transformations are selected via the cryptographic keys.

Each encipherment, or encryption transformation (plaintext to ciphertext), has a uniqoe inverse decipherment, or decryption operation (ciphertext to plaintext), which is also identified by a cryptographic key.

Public key algorithms (PKA) ose a public (nonsecret) enciphering key and a private (secret) deciphering key. At the present time, there is no certified PKA available.

By contrast, the DES algorithm uses the same key for enciphering and deciphering and can be easily implemented in different modes.

Portions of Meyer's and Matyas' forthcoming book, Cryptography — A New Dimension in Computer Data Security, *are printed here with the permission of John Wiley & Sons.*

The block cipher mode transforms a fixed-length string of input bits (called an input block) into a fixed-length string of output bits (called an output block).

A preferred block-chain-cipher mode disguises input plaintext data blocks by modifying them, using an exclusive-OR logic operation, with the resulting ciphertext of the last processed data block before processing by the algorithm. In this manner, patterns in the plaintext are eliminated from the corresponding ciphertext.

A stream cipher enciphers an arbitrary length bit stream of plaintext into an equal length bit stream of ciphertext by exclusive-ORing the plaintext to a cryptographic bit stream that is generated by the ciphering algorithm. For decipherment, the cryptographic bit stream is regenerated and again exclusive-ORed with the ciphertext, yielding the plaintext.

The basic DES algorithm defines a 64-bit block cipher. However, it can be used to generate a (secret) cryptographic bit stream fo encipher data in a stream cipher mode.

To be used in this mode, however, an additional quantity is required — a starting value or "seed" — which must be frequently generated and maintained at both the sending and receiving sites. (A seed is also required for block chaining, but can remain unchanged over extended periods of time.) PKAs are not suited for the production of cryptographic bit streams.

Incorporating Cryptography

There are three common methods of incorporating cryptography into a communications system to achieve communication security: link, node and end-to-end encryption.

Link encryption protects data between adjacent network nodes. However, rather than being an integral part of the nodes, the algorithm is implemented in devices placed at both ends of the adjacent nodes' communication line.

When link encryption is used, with the exception of the few bits required by the line protocol, both a message and its header can be encrypted.

Node encryption is similar to link encryption in that each pair of nodes share a key to protect data communicated between them. However, data passing through the node is not in the clear (plaintext) as in the case of link encryption.

Rather, within a security module or protected peripheral device attached to each node, the enciphered data is transformed from encipherment under one key to encipherment under another key. Clear data is presented only to the final destination node.

End-to-end encryption affords the greatest potential for overall data security because it protects data during transmission between communicating end users. Messages are deciphered only at their final destination — they never appear in plaintext (clear) form at intermediate nodes or at the node's associated security module.

On the other hand, end-to-end and node encryption require that routing information be in the clear. This is because each intermediate node in the communications path examines the routing information in order to properly direct messages to their intended destinations.

With link encryption, every node in the selected path through which encrypted data passes must have a stand-alone cryptographic device connected to its input and output ports. And, with node encryption, every node in the selected path through which encrypted data passes must have its own security module (integrated or attached).

(Continued on SR/47)

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. . . But DES Open to Cryptoanalytic Attack

By Whitfield Diffie
And Martin E. Hellman
Special to CW

The federal Data Encryption Standard (DES), on which many commercially oriented network security systems are based, is more vulnerable to a particular type of cryptoanalytic "attack" than its advocates have maintained.

Motivated by the growing need for data security in its products, IBM initiated a cryptographic research effort, concentrating on nonlinear block ciphers, in the late 1960s. This work has added much to the quality of the unclassified literature on cryptography and has produced several important cryptosystems, one of which the National Bureau of Standards (NBS) adopted as the DES in 1977.

The DES may provide adequate protection for most data communications environments, but we and Stanford University colleagues R. Merkle, R. Schroeppel, L. Washington, S. Pohlig and P. Schweitzer found a number of weaknesses in the algorithm in 1976. Some of those weaknesses are discussed in this article.

But, before turning to that issue, a few basic terms and concepts should be explained.

Usually, the worst situation from the point of view of the cryptoanalyst who wishes to "crack" a method of encryption is to have nothing available but the material he has intercepted, knowledge of the general system and some general knowledge of his opponent's messages.

This may be limited to a knowledge of the statistical properties of the language in use — for example, knowing that in English the character "e" has an average occurrence of 13% in a given text — and a knowledge of certain *probable words*.

Although occasionally a cryptanalyst may be ignorant even of the language or system in use, this is the weakest threat to which a system is normally subjected; any system that succumbs to it must be considered completely insecure. Such a threat is called a *ciphertext-only attack*.

When cryptography is used to protect computer or business data, the cryptanalyst often knows substantial amounts of corresponding *plaintext* (the text in normal, intelligible form) and *ciphertext* (the text rendered unintelligible through cryptography), allowing a *known-plaintext attack*.

The rigid structure of the formal languages used in DP guarantees that the attacker will know much detail of the plaintext and therefore be able to derive important deductions about it.

The known-plaintext attack is a natural extension of the use of probable words in a ciphertext-only attack. In formal languages such as Algol, the almost certain and often repeated occurrence of words like PROCEDURE and INTEGER provide a close approximation to known plaintext in most cases.

We explained in the June 1977 *Computer* how a known-plaintext attack on the DES can be adapted to a ciphertext-only attack when the plaintext is represented in Ascii.

While a known-plaintext attack is not always possible, such attacks are so frequent that a system succumbing to one is not considered secure. The NBS has accepted the known-plaintext attack as appropriate in judging the security of its DES.

The cryptanalyst is sometimes in the even stronger position of being able to see the ciphertext corresponding to any plaintext he chooses. His problem is to determine the key for later use in enciphering and deciphering other messages. This is called a *chosen-plaintext attack*.

Sometimes it is appropriate to consider the cryptanalyst as being able to select either the ciphertext or the plaintext at will. This is the even more powerful *chosen-text attack*.

We and our collaborators found during preliminary analysis of the DES during August 1976 that the algorithm allows a 50% reduction in search effort under a chosen-text attack.

This article was adapted with the authors' permission from a portion of "Privacy and Authentication: An Introduction to Cryptography," which appeared in the March Proceedings of the Institute of Electrical and Electronics Engineers.

A *block cipher* is a cryptographic system that divides plaintext into separate blocks, usually all of the same size, and operates on each independently to produce a sequence of ciphertext blocks.

Although there are minor variations, all of the IBM systems basically use a transposition of the bits within a block for a "fixed-mixing transformation" and enact substitution on 4-bit groups of the block for simple cryptographic transformations.

In an early IBM prototype, the 128-bit plaintext block is broken into 32 4-bit bytes, each of which is acted on by a different, invertible 4-bit to 4-bit mapping or *S-box* ("S" means substitution) determined by a portion of the encryption key.

Any k-bit S-box can be implemented as a 2^k word memory with k-bit words. If the S-box is to be invertible, each of the words must be different. The simplest implementation of a 4-bit S-box therefore requires a 64-bit memory (2^4 times 4).

An 8-bit S-box would require a 2,048-bit memory (2^8 times 8) and a 16-bit S-box would require a 1,048,576-bit memory. IBM selected k equal to 4 as a compromise between cost and security.

If k had been equal to 2, the entire system would be solvable on a minicomputer in a few seconds' time. This is because all 4! = 24 2-bit invertible mappings are *affine* (expressible as

(Continued on SR/41)

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Encryption Only Way To Secure Phone Lines

By Nicholas B. Schklair
Special to CW

Cryptography has undergone many changes in its history; the state of the art is now in the province of mathematicians and electrical engineers. This development was inevitable as computer technology became more widely used in everyday life.

Throughout the ages, people have employed various techniques to disguise their messages. Some common techniques feature a *substitution cipher*, where every letter in a message is a substitute for another letter.

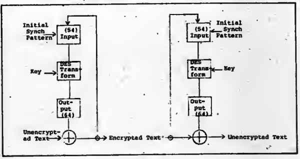

Figure 1

Another technique is the *transposition cipher*, which rearranges the message elements without changing their identity. A method far more difficult to break surreptitiously is the *product cipher*, formed by combining substitution and transposition.

Data encryption is the only effective method for safeguarding data transmitted over telephone lines. Such data is broken down to its simplest form — a coded impulse known as a "bit" and expressed either as a "1" or "0" (representing "on" or "off" circuit states).

Encryption hardware then modifies the bit stream according to a specific algorithm which, in contemporary systems, usually implements some variation of product ciphering. The algorithm is controlled by a distinct number (bit pattern) generally called an *encryption key*.

The algorithm will produce various outcomes, but only one distinct outcome will result from a specific key.

Several years ago, recognizing a need for encrypting its own communications, the U.S. government commissioned the National Bureau of Standards (NBS) to write an encryption standard.

After consulting with the Defense Department's National Security Agency, in 1977 NBS adopted as the Data Encryption Standard (DES) an algorithm submitted by IBM.

The DES algorithm employs the product cipher technique in successive steps alternately performed on the data. With DES, the encryption key is 56 bits plus 8 parity bits. This allows 2^{56}, or roughly 72 quadrillion, distinct key possibilities.

Although the DES algorithm is in the public domain (published as Federal Information Processing Standard 46), the identity of the key used in each application is supposed to be secret. The task facing a would-be breaker of the DES is to learn the identity of the target user's key.

To date, there appears no cryptanalysis technique to break the DES save that of exhaustively searching through the list of all possible keys for the key actually employed by the target user. Some experts claim that, with existing technology, this approach might consume centuries of computer time.

Ensuring Algorithm

While the DES is a general technique, there are several modes of encryption that should be employed to ensure security of the algorithm. The *electronic codebook* mode merely takes a block of data and encrypts it; therefore, a similar block is encrypted similarly

(Continued on SR/46)

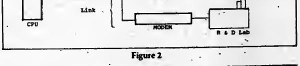

Figure 2

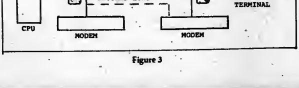

Figure 3

Wall Street Stockbroker Can't Afford Net Loss

(Continued from SR/5)

But Paine Webber insisted on a test to evaluate Intertel's system on-line before signing a purchase agreement. For the initial installation, the brokerage firm selected Intertel's NCS4000 manual network control system to service two "highest volume" lines on the network. Those lines extended to some of Paine Webber's largest branch offices.

"We found a dramatic improvement in the performance of the circuit, the mean time to repair the circuit and the isolation of a problem," Faccibene recalled.

"For example, it usually took us 40 minutes of trial and error to isolate a streaming terminal," he explained. "With the Intertel system, we were able to do it in less than 40 seconds. "We were also able to define a bad circuit bridge, isolate it and get the phone company to do a series of tests to correct the problem. That's something we could never do before."

Smooth Installation

Having passed the initial test, Intertel began adding to the NCS4000 every week two lines with between five and eight drops per line. The local installations were completed after the close of the business day, giving Intertel just three hours to install the equipment and test the line.

Intertel realized it would have to convert the system to its original form if the trial line was not working perfectly when the three-hour period expired. Moreover, all drops on the line had to be implemented simultaneously. That compelled Intertel to have crews working in up to eight different cities on the same line at the same time.

How did the installation go? "Smoothly," Faccibene remarked.

Automatic Control

After working with the NCS4000 manual system for several months, the decision was made to switch to Intertel's EMS-One automatic control system. Again, timing was critical.

In this case, Intertel was able to convert the entire system by adding cards and rewiring the backplanes in less that 48 hours.

Today, the EMS-One network continually monitors 4,800 bit/sec lines with more than 160 drops. The system itself consists of a CPU, hardcopy printer and a monitor with keyboard, CRT and audio alarm.

The system was designed to check for changes in the status of 14 separate test conditions, including line levels, line continuity, terminal power and signal quality. If necessary, an operator can perform 49 more test and control functions manually.

Operating Modes

"Basically, there are three operating modes," according to Brown. "At night, we utilize the Automatic Preventive Maintenance Mode, which lets us test any given number of lines during the course of an evening.

"If the system alerts us to problem with a line, we alert the phone company so it can have the line repaired before we start work the next morning.

"During the day, we use the Automatic or Scan Mode," the senior vice-president continued. "It tells us what areas are falling in and out of spec. It also lets us check the status of modems and terminals.

"If there's a problem that can wait, we take care of it after hours. If it can't wait, we reroute our data and get the vendor working on it right away.

"Finally, we use the manual mode to do a lot of self-testing on the system. In this way, we can make sure the network is operating the way it's designed to," Brown explained.

System Praised

Faccibene praised the EMS-One for its ease of use: "It only took a day or two for our people to learn it. Yet [the system] gave them the ability to define, isolate and report a problem faster and more accurately than ever before."

The EMS-One is also saving Paine Webber more than $7,000/mo in modem costs alone. Another application using EMS-One reportedly saves the firm $1,500/mo in communications costs.

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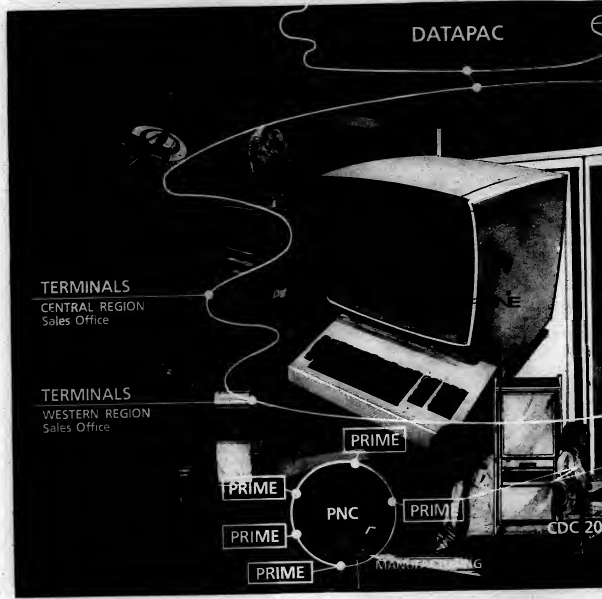

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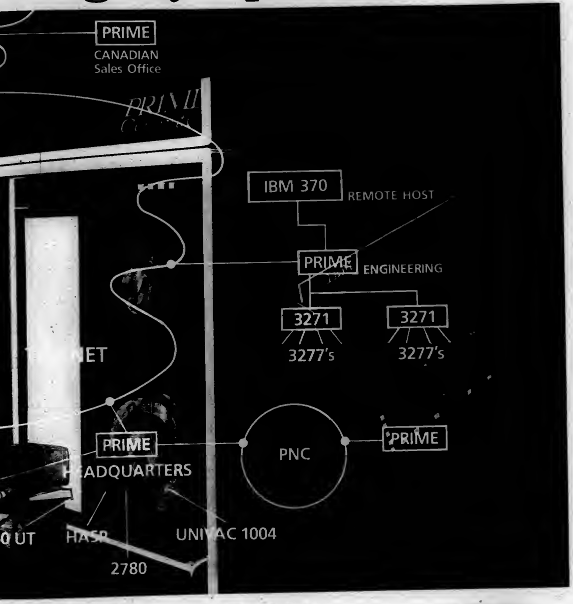

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Systematic Reports Needed to Gauge Reliability

(Continued from SR/2)

sis. The user should establish a rigorous system for ensuring that the "cause of outage" is analyzed every time an outage occurs.

In most cases, the cause may be obvious and an analysis unnecessary, but for some outages — especially those involving hardware and software facilities and intermittent behavior — subsequent analysis by qualified personnel is crucial.

Regular Reports

Once a common data base is established, regular reports of network reliability can be issued. The type and frequency of such reports will depend, to a large degree, on the particular nature of the network examined. However, some general guidelines may be set forth.

First, daily reports provide a "snapshot" assessment of the network's performance for the preceding day. These reports benefit both management and technical personnel if they are regularly filed on the day following the reported day.

The author is familiar with one company whose daily reports of network reliability for the previous day is required to be on the desks of senior executives as they enter their offices each morning.

The daily reports typically include a list of all network subsystem outages — with times of occurrence, durations and causes — and a measurement of overall network availability expressed as a percentage.

Weekly reports provide another and more statistically significant assessment of network reliability because of the longer base of operational time. For this reason, the weekly report gives the user a better understanding of the network's aggregate behavior.

Weekly reports generally contribute information similar to that in daily reports; but they also contain data that is more user-oriented. For example, a useful weekly statistic is the availability per city or location of access.

Such information is necessary to monitor performance as it affects the user. Average network statistics are necessary but not sufficient to isolate chronic or intermittent problem areas.

Finally, monthly, quarterly and annual reports help in assessing long-term performance and trends. These long-term reports should include information regarding failure rates and repair times for each subsystem. The information can significantly expedite isolation of troublesome subsystems by maintenance personnel.

Moreover, longer term reports give management a better understanding of the network's performance trends.

Rigorous System

In summary, a rigorous system for the measurement and reporting of network reliability is an important contribution to reliable network operation.

Such a system provides management with quantitative indicators of network performance and maintenance crews with quantitative indictors of subsystem performance. These systems are neither difficult nor expensive to implement.

Tenkhoff is the president of Network Communications International.

Evolution Leads To Rasp System

(Continued from SR/14)

versions, the remote patch unit is the basic component in Rasp technology. This device employs the same magnetic reed switches as its predecessors, but adds the control elements necessary for remote switching and patching applications. Rasp patch units can be controlled on an individual basis; each unit has a unique address.

Fallback Switching

With Rasp, a user can activate fallback switching on an individual basis or a group basis; suspect system components can easily be replaced in mere seconds. Rasp also provides dynamic alarm reporting based on user-specified criteria. Typical alarms would be for the absence of transitions on a data or control lines.

The system automatically alerts the operator to problem conditions so corrective action can be taken. Rasp enables an operator to monitor a line from a central location apart from the main computer room. The operator can conduct diagnostic tests on that line, substituting standby equipment if necessary.

All system functions are controlled from that central location. No physical intervention in the main computer room is required.

Moreover, Rasp can be installed with any vendor's modems and computers.

Multisystem Rasp

As users expanded their computer networks to include multiple computer rooms at the same or different sites, they required a means of controlling operations at these remote locations. A multiple-system Rasp solves this problem.

At different sites, individual Rasps can be integrated into a single Rasp network with all system activities and functions controlled and coordinated by a master control unit.

Rasp reflects the philosophy of many network managers by providing a single central management site without relinquishing control to an automatic system

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Packet Networks Noted For Reliability, Security

(Continued from SR/2)

By providing multiple links between CPs (a natural feature of a distributed network), the probability of there not being a communications path between any two points can be kept arbitrarily small for a marginal cost.

A distributed network's adaptive routing capability makes its reliability not critically dependent on the perfect operation of each constituent element. For example, after a link failure, the network can reassign data routes rapidly to adjust for the failure.

Typically, the distributed network design provides several alternate paths for network communications between important sites. This allows the network designer to judiciously and economically add links so that the unreliability of IPs and CPs constitutes the only constraint on the network's overall reliability.

Moreover, arbitrarily high network reliability is easily achieved by using redundant off-the-shelf CPs and ordinary communications links.

Studies by Network Analysis Corp. have shown that ultrahigh reliability can be achieved at a very low cost with a distributed packet-switched network that features powerful error control, adaptive routing and message accountability. The average outage between any two sites can be reduced to less than a few minutes per year with an increase of only a few percent in the per-transaction cost.

Network Security

The problem of network security has several different aspects, including the potential for unauthorized access to a computer system or data base and for copying of messages by unauthorized access to a communications link. To safeguard the confidential or high-dollar-value traffic carried by some modern networks, strong security and integrity features are essential.

A well-designed system must provide for identification, authentication, authorization and journaling. To complement this set of interface controls, a secure network must also provide encryption devices.

Two levels of encryption service are normally available: transparent link cryptography at each end of a communications link and session-level cryptography to provide end-to-end encryption.

Although distributed packet networks have distinct reliability characteristics, resolution of security problems is much the same for distributed packets as it is for other network types.

With data communications networks in general, unauthorized access is thwarted by the appropriate use of built-in hardware identification and password schemes. And encryption equipment can easily be attached to each communications link for positive line security.

However, where encryption is absent, distributed packet-switching networks provide better transmission security than other networks. In a packet-switched network, long messages are normally broken into a number of packets, each of which may follow a different path to its destination.

Therefore, unauthorized access to all of the data on a particular communication link would result in the interception of only partial messages.

Moreover, packet-switching yields an excellent overall network architecture for the protection of data from unauthorized or accidental modification, destruction or disclosure.

Network Control Center

Each CP in the distributed packet-switching network performs all network communications functions for its hosts. The CP is responsible for routing, monitoring the alive/dead status of its communications links and neighboring CPs, controlling errors, preventing traffic congestion and monitoring time delays.

Hence, the CP functions as a local network manager, deriving its information from the network and deducing the status of other elements within the system.

Because local network management functions are naturally performed by the network itself, the environment is especially suited for effective "global" network management. This function is implemented throogh a Network Control Center, which is vital to the operation of a reliable network.

The Network Control Center appears to the network as another host. This host automatically collects, on a nearly instantaneous basis, the status reports generated by each CP and is thus able to alert operators rapidly when CP or communications lines fail or when line errors or other fault conditions appear.

The Network Control Center thus serves as a tool to minimize the time required to identify and initiate correct actions and to maximize system reliability and availability.

These characteristics of rapid access to vital health and performance data are substantially different from most present-day networks, for which it is usually extremely difficult to monitor network performance.

Network Protocols

Network integrity is the maintenance of communication-related information in such a manner that each element receives the current version of the communication information it requires.

In order to establish and terminate logical connections between physical stations, to handle the transfer of data between them and to ensure the message integrity in those transfers, distributed packet-switched networks have developed and employed standard multilayered protocols.

Under this approach, various services of increasing capability can be built on top of one another, each using the facility of the service layer below and supporting the facilities at the layer above. These concepts of protocol layering, as well as standardization, have provided absolute data integrity and a guarantee that no data is garbled or lost without detection.

In summary, packet-switching nets seem ideally suited for today's data communications application. They can provide a reliable, highly available network service that ensures the integrity of user data. And they can provide comprehensive management control.

Eisen is a member of Network Analysis Corp.'s technical staff.

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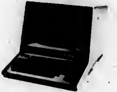

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Small Networks Gain Large Nets' Functionality

(Continued from SR/16)

network processors (INP.). These products are made possible thanks to inexpensive microprocessor technology and the expertise of independent data communications suppliers and manufacturers.

As shown in the accompanying figure, INPs consist of designs based on single or multiple-microprocessors whose principle function is to provide line-cost savings through statistical multiplexing and data compression. The INPs are deployed to:

- Multiplex data streams at the network's terminal end.
- Transmit the combined data over a single line to the host CPU.
- Demultiplex the combine data stream at the host CPU for connection to the host's individual terminal ports.

The additional capacity and programmable nature of INPs allow enhanced capabilities for ensuring reliability and integrity in small to medium-sized networks.

INPs can run transparent to the user's existing hardware and software and usually support a range of communications protocols, both synchronous and asynchronous.

Further, such processors have error detection and correction mechanisms that result in virtually error-free transmissions. INPs permit inexpensive asynchronous terminals to achieve the same data integrity possible with higher priced terminals that use sophisticated synchronous protocols and retransmission commands from the host processor.

By gathering network statistics, INPs also contributed to reliability and integrity. The processors continuously monitor and accumulate the statistics in three areas:

- Terminal subnetwork — terminal activity (such as transmission speeds), character error rates and statistical loading.
- Multiplexed data link — retransmission rates, error density and line utilization rate.
- INP operation — INP loading, buffer utilization and traffic density.

With INPs, network statistic are conveniently available off-line, at either end of the multiplexed link, through use of hard-copy control terminal.

Statistics impact on network reliability by enabling:

- Rapid failure diagnosis.
- Forward visibility of degrading network elements prior to actual failure, allowing deployment of maintenance services before hard failures occur and greatly improving system availability.
- Constant awareness by the system manager of traffic distribution. This permits reallocation and upgrading of network resources to support changing or increased network requirements.

Finally, INPs give centralized network configuration control. Network failures, unattended operation and configuration changes impose tremendous day-to-day operational hardships on system managers of any network, large or small. All these issues are addressed by INPs.

For example, the processors allow control of line type — whether synchronous or asynchronous — line speed, code type and other parameters. Centralized configuration control can quickly reroute traffic around failed network trunks and maintain system availability while the links are repaired.

INPs are generally priced from $1,500 for a four-terminal configuration to $15,000 for a 228-terminal configuration. This compares with $50,000 to $100,000 for "equivalent" remote concentrator systems.

Lynch is director of network products for Codex Corp.

School Enrolls Smart Selector

(Continued from SR/9)

Micom. It actually designed the 610 according to some of our specifications," Koontz continued.

Delivery was promised for August, "but it didn't make it until December 1978. I think we were the third customer to receive the 610."

When the unit was installed, problems with the memory cropped up, but in two or three weeks, "with constant daily involvement between myself and the Micom staff, we came up with a fix. We programmed and 'burned in' Micom's programmable read-only memory; it sent it to me and the problems were gone," Koontz recalled.

Koontz is pleased with the way the firm has handled problems he reported. Micom has been "very helpful in troubleshooting systems problems," he said, adding that the equipment "gives us more capability than we originally required or expected."

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Nets Pose Special Dangers of Computer Fraud

(Continued from SR/3)

can be taken to reduce the exposure.

The more common penetration techniques include:

- *Masquerading.* A perpetrator may pretend to be an authorized user and may attempt to gain access to a computer system and its data as that user. But he would need the user's identification and authentication information to do so.
- *Eavesdropping.* This involves tapping or cutting in on a communications line, or on a satellite or radio microwave link.
- *Piggybacking.* The perpetrator inserts a special terminal into the communications line, then intercepts the transmission between the user and the computer system. He may intercept and modify the user's input, or completely replace it, before sending that data to the host CPU.

The piggybacker typically transmits an error message to the user indicating that the system is not available or has gone down.

- *Line grabbing.* The perpetrator inserts a special terminal into the communications line. He eavesdrops on the line until the authorized user signs off the terminal. He then intercepts the user's sign-off, preventing the message from reaching the system.

The line grabber transmits the expected system sign-off message to the authorized user and employs the "grabbed" line to access the system.

The controls and safeguards that exist in a communications environment include:

- *Physical security.* There are only a few isolated points in a communications network where wire tapping is not extremely difficult.

Your telephone closet is one of the most vulnerable places. You frequently make the job easy for a wiretapper by prominently labeling your data communications lines. You should, therefore, physically secure your telephone closet and carefully restrict access to it.

Communications lines that exist solely on your own property should be buried in metal conduits in concrete-filled trenches. This will inhibit wire tapping by making the lines hard to reach.

- *Encryption.* This may provide the only secure way to protect your passwords and data during transmission, especially when microwave communications links are used.

Encryption is the process of transforming the data transmitted over the communications links to render it unintelligible doring transmission. The transformation may be accomplished by transposition of the characters in the data or message, substitution of the characters with other characters or groups of characters, or logical, arithmetic and algebraic manipulation of the characters in the data or message.

- *Transaction serial numbering and "time stamping."* With this technique, the host computer assigns a unique sequential identification number to each transaction received from terminals.

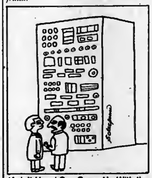
Often, the terminal operator will also have this identifier displayed on his terminal. The transactions with their appended serial numbers are recorded, as they occur, on a tape or disk known as the transaction log or journal. The technique is sometimes called "journalizing."

- *Automatic terminal disconnect.* The computer system software should automatically disconnect a terminal from the network after a predetermined period of inactivity. However, users should not rely on this feature. They should disconnect the terminal themselves when they have finished their session.
- *Wire tap and bug checks.* On a periodic basis, and whenever there are any suspicious occurrences, experts should be summoned to examine your telephone closet and test communications lines for the presence of wiretaps or bugs.
- *Call-back procedures.* In a sense, these constitute an authentication scheme by which the network's host computer system verifies that a user is who and where he says he is.

The user signs onto the system and enters his user's identification and terminal location. The computer system establishes the user's identification and terminal location and then disconnects him and "calls back" the identified terminal.

Krauss is a consultant in the areas of DP management and computer security. He has lectured at the Federal Bureau of Investigation Academy on techniques of computer fraud investigation.

MacGahan is an officer of the Chase Manhattan Bank who, for an M.B.A. degree from New York University, wrote a dissertation on computer fraud.



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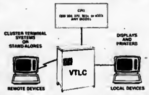
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Reduces Net Downtime, Costs

Net Design Integrates Management Controls

By Dr. Thomas R. Armstrong
Special to CW

The benefits to be gained from distributed data processing (DDP) have begun, at last, to outweigh the fears the idea once conjured up in managers' minds. The question is no longer "whether," but "how much?" Virtually every large computer user is wrestling now with specific equipment decisions and implementation timetables.

But one fear persists, and justifiably so, especially for those building host-centered networks. As the use of networks increases, so does the organization's dependence upon those networks. Despite the bottlenecks caused by malfunctioning mainframes, those problems could be isolated and corrected with relative ease. Elsewhere within the organization, work could proceed with little disruption.

Failures in communications networks, by contrast, can occur at any location. Those failures are harder to find than failures in the computer room, and also harder to fix. But when they do occur, operations at the affected locations are "down," or in a degraded mode at best. Whether caused by device breakdown or by below-par performance on communications lines, failures in communications networks severely limit the flow of information throughout the entire organization.

A failure at any network location need not result in costly downtime. Several vendors of data communications equipment have developed network monitoring and/or control systems in response to the problem. When properly designed, such systems can increase network reliability and lower total network operating costs.

An effective network management system will tell a user precisely what is wrong with his network, and precisely where — perhaps even why — that problem exists. The availability of that information can reduce the time required to restore failed circuits from days to hours, or from hours to minutes. That increased uptime represents lower transmission costs per bit, and that cost reduction can quickly justify the cost of the network management system.

Considering the investment managers make in their networks and the importance of those networks to their organizations, the goals of increased reliability and lower transmission costs have not been given the attention they deserve from users and vendors alike. Network management systems are often an afterthought when they should be a primary concern. The management system should be designed as an integral part of the network, at the same time the network is designed.

Micro-Control

Microprocessor-control is the key to designing a network control system that is not only reliable, but also flexible. Noninterfering management intelligence can be distributed throughout the network to operate in parallel with the communications system.

Shown here operating the Analysis network control system from Paradyne Corp. is Dr. Thomas Armstrong, who directed its development.

More specifically, a diagnostic microcomputer can be incorporated into each modem to facilitate interdevice communications. Operating conditions at each drop within the network are collected by the diagnostic microcomputer and compared against prestored parameters. A central site minicomputer polls each drop on a regular basis and displays an alarm condition for each performance limit exceeded.

It is important that network control be established where it best suits an organization's needs — at the central site or in remote locations. A properly functioning system means that systems support personnel and dedicated operators are not required at remote sites.

And such a system eliminates extensive support devices as well. All testing can be done from a central location, saving time and the possibility of increased errors in transmitting error information from site to site.

Moreover, processing can be transferred back to the host or another unit in the network in the event of failure, or network communications can be temporarily suspended while processing continues. This feature allows operators to contact the telephone com-

(Continued on SR/34)

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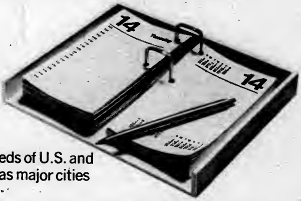

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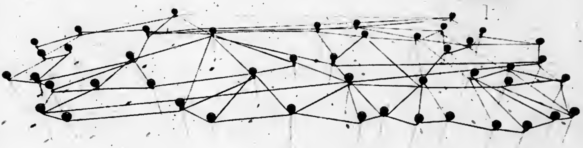

Net Design Integrates Management Controls

(Continued from SR/32)

pany with correctly identified problems, expediting repair and decreasing costs.

One systems design approach can be set up to meet six requirements fundamental to effective network management. The goals for such a system are:

- To allow operators to assess the performance of the total network, as well as performance at any site within that network, in real time.
- To provide information on the performance of communications lines, as well as the performance of modems and devices on the network.
- To provide fast, thorough and effective fault diagnosis and circuit restoration procedures.
- To be completely transparent to those using the network. The system must be noninterfering, providing information on network conditions without interrupting the flow of data. Further, it should have no negative effect on the reliability or the throughput of the network.
- To permit cost-effective installation and operation and the ability to provide increased data throughput through increased network reliability.
- To provide a system simple enough to be used by personnel with no special training, yet sophisticated enough to appeal to highly skilled systems engineers.

The ability of a network to pass data depends upon the operation of each modem, each communications line and each device in the network. A network management system, therefore, should be considered incomplete unless it provides information on all three network elements.

The first two of the six basic network management system requirements are interrelated. An operator cannot assess network performance without the ability to assess lines, as well as modems and devices. And if speedy restoration crucial to the cost justification of a network management system, it is clear that information should be provided in real time.

Surprisingly not all network management systems provide information in real time. Further, most systems currently available monitor only the interface signals between modems and the devices to which they are attached.

As a result, those systems monitor the quantity, more than they do the quality of data transmitted. If the modem receives data, it is assumed that the device is operating properly. Those systems do not measure line loss, noise, phase jitter or other impairments that could result in high error rates from devices that appear to have no problems.

By contrast, network control systems that are able to monitor line impairments through intelligent modems can track the performance of specific lines and specific drops over time, developing circuit profiles that enable an operator to take corrective action prior to "hard" failure. Often, that action can be taken before the end user experiences any difficulty in transmission.

Those and other management reports can also be used to recover the cost of below-par lines, or to document requests for rerouting. Line recovery alone could provide cost savings of thousands of dollars per month, speeding the return-on-investment in an effective network mangements system.

Fault Isolation

The third fundamental requirement for effective network management is provision for fault isolation, fault diagnosis and circuit restoration. Operators must be able to act quickly and effectively upon the information they receive. Tests should be executed from the central site, without requiring either highly trained personnel or remote equipment.

Basic restoration capabilities should incorporate dial backup, the ability to switch automatically to a "hot" standby modem at critical drops and the ability to disable "streaming" modems.

The application of distributed network management intelligence allows an operator to determine quickly and easily which system element is faulty — the line, modem or terminal. This saves valuable restoration time, because the operator knows precisely which network vendor to call.

If the fault is in the line — and the vast majority of network failures result from line impairments — remote diagnostic capabilities can save valuable telephone company test time by pinpointing the nature of the fault.

Noninterfering Systems

The fourth system requirement, transparency, relates directly to the architectures of the management system. There can be no operator involvement required from remote devices, nor should those operators suffer degraded response times.

Moreover, although network management adds to a layer of hardware, software and/or firmware complexity, overall reliability must not be allowed to suffer.

A typical system could use a noninterfering, out-of-band telemetering channel for transmission of management information. The use of microcomputer intelligence at every network drop will eliminate the need fot remote operator involvement, since the network can be controlled from a central site, and also meets the reliability requirement: the remote diagnostic processor can diagnose its own faults as well as the faults on lines, modems and

(Continued on SR/38)

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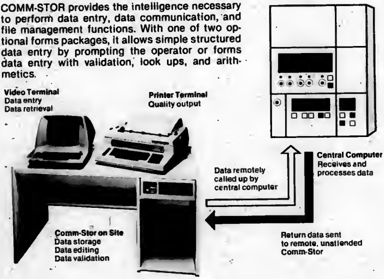

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Diagnostic Control Center Keeps Bank Net Up

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LOS ANGELES — Keeping an on-line data communications network up and running is a demanding job at any company, but uptime is of paramount concern in a banking network consisting of more than 4,000 terminals in 11 states.

"In order to keep failure time to a minimum across three shifts 24 hours a day, a diagnostic control system is essential," according to Michael Belitz, vice-president of Western Bancorp Data Processing Co. (WBDPC), an affiliate of a multibank holding company called Western Bank Corp. that provides computer and telecommunications services to 21 banks in the western U.S.

The network Belitz and his staff operate is known as the Teller Item Processing System (Tips). The net handles on-line customer transactions and daily account updates for the organization's affiliate banks.

Since Tips began operation in 1976, Belitz has relied on control equipment to monitor the operation of the network and keep outages to a minimum. "We knew this would be a large network right from the start, so diagnostics played an important part in our overall system design," he said.

WBDPC selected its modems based on the network management functions they incorporated. Belitz and his staff evaluated products from Pacific Telephone and Telegraph Co., Racal-Milgo, Inc., Codex Corp. and Intertel, Inc.

In 1976, the phone company did not offer equipment with diagnostic features that could be managed from a central site. Further, Bell modems were available on a rental-only basis, while other vendors provided purchase options that would allow WBDPC to amortize its equipment.

Only First Step

After careful evaluation of the available systems, WBDPC decided Racal-Milgo offered the best features at the best price. But selection of the vendor was only the first step. Diagnostic control systems are customized, and the functions and equipment must be tailored to the needs of the user and the network.

WBDPC operates IBM 370 mainframes at its Los Angeles-based processing center, and member banks have purchased the IBM 3600 financial terminal system. This made it logical to use IBM's Synchronous Data Link Control (SDLC) and the 3600 loop architecture at teller terminals in the Tips network.

The monitoring and diagnostic features incorporated in the network control system had to be compatible with the operating characteristics of the equipment. Racal-Milgo representatives and members of Belitz' staff cooperated to design the control center.

Early in 1977, a 50-location pilot of the Tips network — including a small version of the ultimate network control center — was put into operation. The initial control equipment included a System 180 from Racal-Milgo.

The test lasted for several months and, in July 1977, the board of directors of Western Bank Corp. authorized the expansion of Tips into a companywide network encompassing all affiliate banks.

The Present Network

Today, the network includes IBM 3604 teller terminals, 3601 controllers, 3610 printers, 3614 and 3624 automatic teller machines (ATM), Diebold, Inc. Model 910 ATMs and Docutel Corp. ATMs. Forty-two multidropped private lines use Racal-Milgo Model 24 LSI modems operating at 2,400 bit/sec with AT&T facilities.

At the DP center, two 370/168s maintain the Tips data base with help from nine 3705 front ends. The CPUs use the Airline Control Program (ACP)

(Continued on SR/38)

Western Bancorp's Los Angeles-based network control center, a portion of which is shown above, serves more than 4,000 terminals in 11 states.

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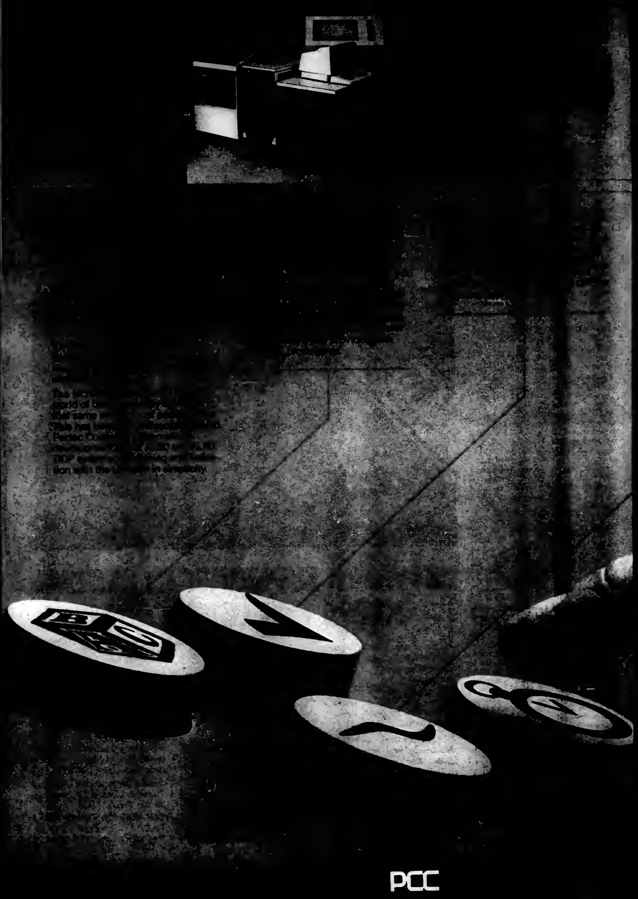

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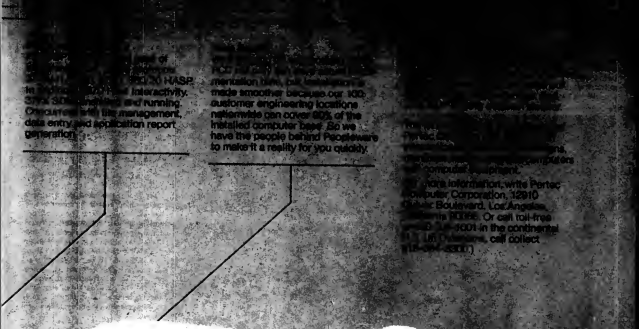

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Diagnostic Control System Keeps Bank Net Up

(Continued from SR/35)

with a special subset of Vtam. The IBM Network Control Program (NCP) also runs under ACP.

The diagnostic control center is in a separate room and includes three operator monitoring stations. The System 180 has been upgraded to a System 200, which provides a 75 bit/sec supervisory channel on the network to coordinate control functions.

Using the supervisory channel, the System 200 polls all network modem locations in sequence without interfering with normal data transmissions. Using a set of self-test commands, operators at the control center can perform loop-back and other tests on the modems. Many of these tests can be run during regular network hours, with more detailed diagnostics being done during other shifts.

Available to each operator position in the network control center are a Racal-Milgo 220 transmission test set, a Halcyon 702A transmission line monitor, a Spectron Corp. D-502 Datascope, a Spectron 1924 test lead break-out panel, digital and analog Spectron patches, a power supply from Teleprocessing Products, Inc., modem simulators and other specialized units.

The control center reportedly monitors lines, prints out detailed operating parameters and helps the seyen specialists in the network control group keep the Tips network operating efficiently.

Often, early detection of errors in a particular line or unit at the control center will allow the staff to take corrective measures before a failure occurs. While Belitz' staff cannot guarantee 100% uptime, the network would be much more failure-prone without the center, Belitz said.

Phone Company Cooperation

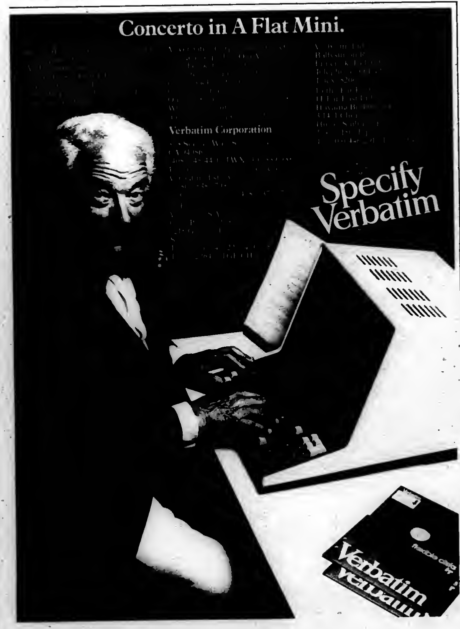
One of the most important benefits of the control center is that there is much closer cooperation with local phone company technical specialists. When the System 200 was installed one weekend in November 1978, local phone company technicians observed the installation and worked with WBDPC communications personnel to develop reporting procedures.

As a result, phone company representatives are more inclined to react positively to problems reported to them by WBDPC Network Control.

At present, affiliate banks still require paper backup to the account and transaction information provided by Tips, but Belitz believes that in the future it will be possible for them to rely solely on the network data.

In the meantime, the WBDPC telecommunications staff is continually adding to the Tips network and getting ready to handle dramatically increased ATM transaction volumes.

Because machines now being phased into the network will be available to bank customers 24 hours a day, they present another challenge to the network control staff. Belitz expressed confidence that his experts, using the network control center equipment, will be able to keep the expanding network operating efficiently.



Design Scheme Cuts Downtime

(Continued from SR/34)

devices.

The fifth requirement, that a network management system be cost-effective, has implications both for installation and operation. A complete network management system, including modems, central site hardware and all appropriate software, must be cost effective to install. To be cost-effective after installation, however, a system should also satisfy the sixth requirement — the combination of simplicity and sophistication. It should not require operation by highly skilled personnel.

Distributed Intelligence

Using microcomputers to monitor operating conditions at each drop fullfills this requirement as well. The diagnostic microcomputer collects and compares information as necessary, then converts that information to digital words prior to transmission to the central site. As a result, alarm conditions throughout the network or the complete status of any individual drop can be displayed or printed in common English.

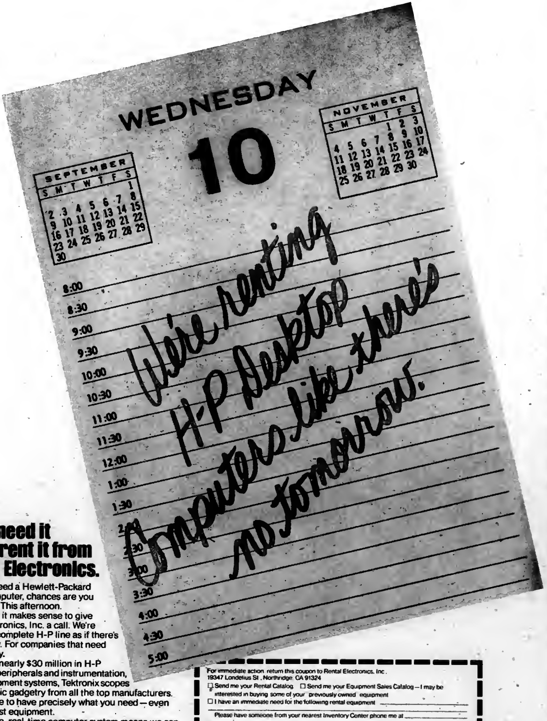
The design approach also simplifies the central site operator panel, eliminating the need for multiple function keys while providing greater flexibility through firmware. The operator can call for alarm or drop status displays, or call for a variety of diagnostic tests, through display prompts and simple keyboard commands.

Integrated Management

Distributed intelligence offers the same benefits for network management that it offers organizations in need of improved information flow. But whether that design approach or another is selected, it is important that network builders incorporate effective management so that a failure at any network location does not necessarily result in costly downtime.

They can best do that by making management an integral part of the network design process and by considering the application of fundamental management requirements.

Armstrong is Paradyne Corp.'s manager of communication and planning.



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CW 11/26

But Service for Net a Problem

RJE Revs Up Reliability for Auto Parts Supplier

By a CW Staff Writer

SOUTHFIELD, Mich. — A major supplier of parts to the automobile industry has enhanced its overall network reliability by replacing remote computing systems with remote job entry (RJE) terminals connected to a central site.

However, more work has to be done to increase the network's usefulness and to reduce reliability problems with some system components, according to David Bonskey, production support and data security analyst for Federal-Mogul Corp.

Federal had no central data communications tie-in-between its several manufacturing plants and headquarters here in Southfield until 1975. "Each site functioned independently, and each system was not smoothly interfaceable with another," Bonskey reported.

The company used a Burroughs Corp. B5500 at its headquarters for corporate applications, with IBM 360/20, 360/30 and 360/40 general-purpose computers at its billing center, a distribution center and at manufacturing facilities.

Today, Federal has RJE systems from Northern Telecom System Corp. at each of its 15 manufacturing plants and two systems at the Jacksonville, Ala., worldwide distribution center.

These systems are interfaced through leased lines to an IBM 3032 running under MVS and an IBM 370/158 MVT, both located at the Southfield headquarters. A typical RJE system supports an average of four data stations per master console for data entry, 5M-byte or 10M-byte disk drives and a 400- or 600 line/min printer.

The manufacturer formerly used punched cards at these sites and still has a couple of batch terminals left with a card reader and card punch. Primarily, though, data is keyed in at a remote site; batches are completed and work is put together on disk and transmitted with job control language (JCL) over a teleprocessing line for processing by either the 3032 or the 158.

While processing is carried out, jobs are placed onto spool disk files, and results are printed at the manufacturing plants or at the distribution center.

Daily Benefits

About 1,500 jobs a day are processed in Southfield, and plants generate about one million printed lines per month, according to Robert Wint, manager of information systems for Federal's Sealing Products Group Division.

At its Worcester, Mass., plant, a Northern Telecom Model 74 Keybatch system was installed in February 1977 to a replace an IBM System/32. It is used for data collection and data entry for production and inventory control, order processing, accounts payable, sales analysis and general business accounting applications — "just about the only thing we don't handle is accounts receivable," DP manager Paul Doherty said.

Comparing the 74 with the System/32, Doherty said the IBM system "didn't fill the bill; especially for the dollars."

According to Wint's figures, an IBM 360/40 would have cost $4,000/mo, while the Northern Telecom equipment reduced this cost to between $1,600- and $1,700/mo.

At the same time, editing procedures are made easier and operator efficiency was increased approximately 30% going from punch cards to the Keybatch terminals

Moreover, Doherty has been able to reduce his DP staff 50% by taking advantage of the terminal's automatic tracking of actual operator keying time.

Support Problem

But with all these advantages, the company would like to further improve its systems, and weed out its problems, which center around equipment reliability and availability of parts to effect repairs, Bonskey said.

"As far as the ability to ensure availability of systems, I can't say it has been very good. We've had a number of problems through the years, especially in certain locatiuns where support and the vendor's ability to service the problem had been quite bad."

Some vendor choices for products — printers for example — have given the firm far more trouble than one normally expects from an electromechanical device, he said.

The analyst also had a complaint about the equipment service staff, which appeared to him to be "learning as they go." He indicated that it has not been thoroughly trained to go out and service the equipment, "which has caused us a number of problems in getting things repaired."

Since the merger of Northern Telecom and Data 100, service forces from the company have been "intermixed," he said, but added, "there are promises that it will get better, and I certainly hope that it will."

Still, Federal has entered into a pilot program with Burroughs Corp. where that vendor is providing the firm with the B1800 terminal. "If the pilot goes well, we'll start switching from Data 100 terminals to Burroughs at some of our locations," he said.

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DES Algorithm Open to Cryptoanalytic Attack

(Continued from SR/21)

equations of a linear plus a constant). [The authors' March *IEEE Proceedings* article presents more details of this claim than can be included here.]

The moral is clear: Affine mappings are to be avoided. Mappings which are "close" to affine should also be avoided and probably resulted in IBM's not using k = 3 even though only 3% of the invertible 3-bit-to-3-bit mappings are affine.

Further study is needed to determine the minimum usable value of k. IBM apparently feels k = 4 is adequate. A larger value of k would provide a greater margin of safety against unforeseen weaknesses but may not be necessary.

The DES algorithm uses a different structure than described above but is still based on S boxes. After a fixed initial permutation (IP), the DES' 64-bit plaintext block is broken into left and right halves, L_0 and R_0, respectively, each 32 bits long.

The algorithm then performs 16 rounds, each of the form:

$$L_i = R_{i-1}$$
$$R_i = L_{i-1} \oplus f(R_{i-1}, K_i),$$

Where $\oplus$ represents component-wise addition module 2 (exclusive OR), K_i is a 48-bit portion of the key used in round i and f is a function with a 32-bit output.

'Computer Software. What's Your Hype?'

The 1976 study found that none of the DES' S-boxes are affine (if they were, the overall algorithm would be affine), but noted some structures that tend to weaken the algorithm's resistance to attack.

We determined that the DES possesses a symmetry under complementation that halves the time necessary to discover the encryption key under a chosen text attack. We found no other weaknesses that would trim the time further, but a number of questionable quasi-linear structures cropped up that suggest substantial further reductions are possible.

For the record, NBS and the Defense Department's National Security Agency (the federal cryptographic authority) have stated they are not aware of methods for exploiting the quasi-linearities.

Because 2^{56} or almost 10^{17} distinct keys can be generated with DES, it might appear that even a substantial reduction in search effort would leave the algorithm secure.

Unfortunately, technology has progressed to the point where searches of this size are economically feasible. To facilitate exhaustive search, an LSI chip can be built to search one key every microsecond.

By building a search machine with a million such chips, all searching in parallel, 10^{12} keys can be searched in 10^5 seconds, which is about one day.

The authors have elsewhere given a detailed justification for the feasibility of this machine and estimate its cost to be $20 million and the average cost per solution to be about $5,000.

These arguments and estimates have been disputed by spokesmen for both NBS and IBM.

Diffie and Hellman are probably the best-known critics of the Data Encryption Standard, although their views are shared by a number of other cryptographic experts. Diffie studied under Prof. Hellman at Stanford University and is now a member of BNR, Inc.'s scientific staff. Besides his Stanford activities, Hellman engages in lecturing and consulting for Hellman Associates, 730 Alvarado Court, Stanford, Calif. 94305.

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To Check Net Performance

Users Cite Need to Monitor Every Terminal

By Timothy P. Ahlstrom
Special to CW

Insufficient network reliability, poor response time and other performance problems with data communications limit the productivity of large users in government and a wide range of industries.

To solve or at least minimize the effects of such problems, user management must have timely and accurate information about the status to terminals and other devices attached to the network.

Those observations came from the data center operations managers for 12 large U.S. corporations and government agencies who gathered in New York City last year to discuss "running a teleprocessing data center in the 1980s."

"To get their work done, hundreds of terminal users depend on the service I provide," an operations vice-president for a major bank told the group.

Large network users need a system with color graphics to monitor the performance of every terminal in the network. So claims the author, whose firm makes and sells such a system.

"The problem is that my operations people have so little information about the performance of our network that they depend on the users to find out how the system is performing!"

The banker and his colleagues at the meeting agreed that a system able to monitor the performance of every terminal on every line of the network is sorely needed by network management.

Hence, the major obstacle management faces in trying to improve network performance is lack of information about the network.

Large-Scale Problem

As a telephone company data center chief put it, "large-scale data center managers run a big, complex automated system. A teleprocessing data center, like any big automated system, depends on a few operators to keep it running properly.

"For example, the control room of an electric power generating plant shows operators the status of every part of the plant," the phone company manager continued.

"The control center of an electric power distribution network monitors the critical parts to the network and displays information for the operators who control it. And the cabin of a jumbo jet airliner has instruments showing how every important part of that system is functioning.

"But in our teleprocessing data centers, we fly blind," the phone official said. "We have almost no information about response time, how busy the system is or how busy the lines are.

"Most important," he said, "we have no way to look at our service to users the way the user sees it. The user may be seeing a 30-sec response time when we promised 10-sec response. And we don't even know that this response time is bad until he, or his boss, or his boss' boss, calls us to complain."

Parallel Techniques

A chemical company executive told the group "what we need is to apply the same techniques that have been successful in other big automated systems — like a jumbo jet, a power generating plant, a power transmission network or an oil refinery.

"What we need is a little computer to watch over the big ones and the entire network," he stated.

These observations about response times and "little computers" to watch over "big computers" reflect the proliferation of terminal stations at points dispersed from central DP sites in current network environments.

Such concerns differ from the plight of operations management at the start of the 1970s, when a large data center was generally easier to run than it is today.

In 1970, a typical large data center had two or three mainframes with 256K or 512K bytes of main memory each, primitive multiprogramming operating system, two dozen tape drives and perhaps a dozen disk drives. A few innovative centers might have experimented with front-end processors, such as IBM 2701s or 2702s.

The work was done in batches: jobs entered the facility in the afternoon and early evening, were run overnight and finished early the next morning before office hours. When problems arose, the user usually had enough time and hardware to rerun the jobs and still finish before morning of the following day.

Today's Data Center

Today's large data center has the same two or three large-scale computer systems, but now with several megabytes of memory each, the same number of tape drives and vastly increased on-line data storage capacity.

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(Continued on SR/46)

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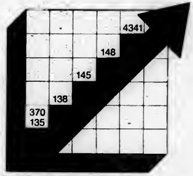

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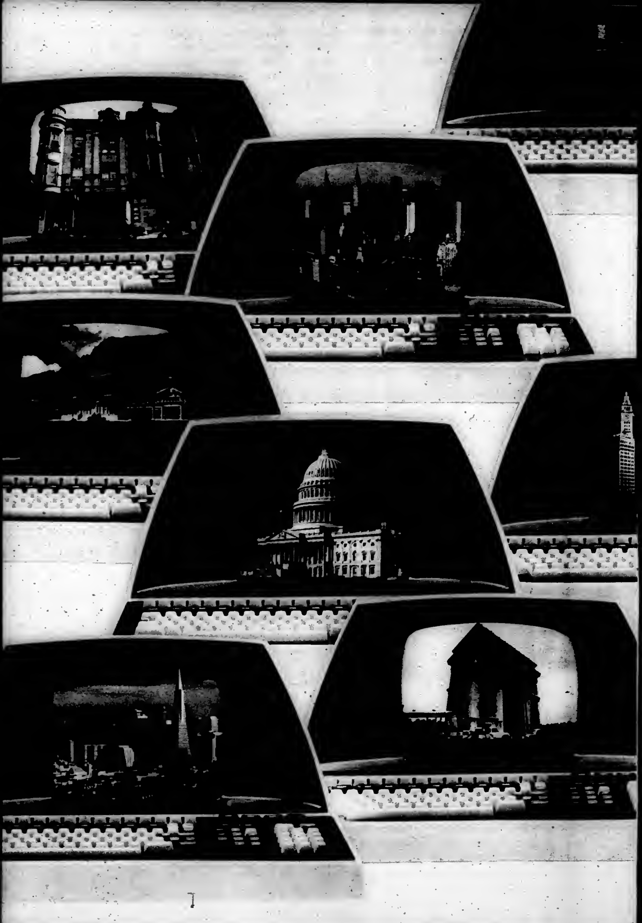

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Encryption Only Way To Protect Phone Lines

(Continued from SR/22)

each time.

Cipher block chaining, another mode, relates each block to the preceding one. However, if an error occurs in transmission, synchronization is lost until the device recognizes a synchronization loss.

Another method, which is not only secure but maintains synchronization, is the *cipher feedback,* or self-synchronizing stream cipher method (see Figure 1).

With cipher feedback, an initial 64-bit synch pattern is fed into the input block and encrypted via some 56-bit key. When this pattern is transferred into the output, it is XOR-ed bitwise with the unencrypted text.

The result is a message stream transmitted to the receiver, who reverses the process. The synchronization is maintained because, as each block is transmitted, it is also fed back into the input block, as the figure shows.

Also, after each message, a new initialization pattern is input that will ensure protection against line hits and errors. The encryption is dynamic, which means that the same block would be encrypted differently each time to further confound the prospective eavesdropper.

Complying Devices

Manufacturers of encryption devices that comply with the DES include IBM; Racal-Milgo, Inc.; Motorola Corp.'s Government Electronics Division and Codex Corp. subsidiary; and Rockwell International Corp.'s Collins Division.

These devices employ encryption between communications links in a network (see Figure 2). The encryption devices should be placed between the CPU and modem at the central site and between the modem and data terminal at remote sites.

Figure 3 shows how a point-to-point line would be secured. Note that an encryption device is always located on the modem's digital side.

Although the devices utilize the same DES algorithm, there are different approaches available to generating and disseminating encryption keys — activities of paramount importance from a security standpoint.

With Racal-Milgo's Datacryptor system, all keys are genersted by the master Datacryptor on a particular line. No human can enter or choose a key.

Under this scheme, keys are dumped to a key transport module (KTM) in an encrypted format using a unique access algorithm. If lost or stolen, the KTM will be of no practical importance because the loading of the device in a Datacryptor causes erasure of the key.

Moreover, in multidrop synchronous environments, all stations have their own respective and distinct keys.

The Datacryptor permits a blend of encrypted and unencrypted drops on the same line without compromising security. In larger networks, the system permits the auto key transfer method of key management. This allows communications lines to distribute the keys; a key is sent to each station encrypted under a unique master key with frequent key change intervals.

Will there be another approach to commercial encryption other than the DES? Some experts speculate that in 10 years the DES will not be secure enough.

New schemes, such as public key systems, are in the research phase at present, but predictions of when they will be available to users are pure conjectures.

Suffice it to say that right now the DES is the best approach available and will continue to be so until someone can readily crack it with a minimal expenditure of time and money.

Schklair is Racal-Milgo's product manager.

Need to Monitor Nets Cited

(Continued from SR/42)

adays, two, three or more transmission control units interface with a network of 20, 50, 100 or more communications lines.

And at the opposite end of the line from the operations manager, hundreds or even thousands of user terminals function to query or update online files and to meet the daily needs of a corporation's customers.

Proposed Solutions

The New York meeting arranged by Avant-Garde Computing, Inc. led the DP vendor to develop a system to continuously monitor the performance of every terminal on every line of a network. Already installed on a pilot basis, the "Net/Alert" system was formally released last month [CW, Oct. 22].

Net/Alert's "little computer to watch over the big computers" approach represents sn alternative to the solutions proposed by operations managers at the New York meeting.

One participant was considering a proposal by a modem manufacturer for a microcomputer-controlled system to continually check on the status of lines and modems and report performance statistics to an operator.

Another participant was considering a computer-controlled system to bypass failed lines and components, routing data traffic through alternate components and circuits.

Still another operations manager was mulling over a proposal for an automated test equipment system to troubleshoot remote network components from a central site.

But none of those solutions would truly meet the needs pinpointed by the operations managers.

With a system like Net/Alert, measurements of response time, transmission volume and network status would be presented in an easy-to-use format on a color graphics CRT screen. Operators would use the system to isolate problems and discover their probable causes. Detailed performance statistics would be recorded and used by network planners to improve line and terminal configurations.

Ahlstrom is a vice-president of Avant-Garde and a principal developer of Net/Alert.

Cryptography Provides Practical Data Security

(Continued from SR/20)

However, with end-to-end encryption, only those nodes that originate or receive encrypted messages require a cryptographic capability. And for a host node, the encryption capability can be used for file security (in a manner very similar to end-to-end) and other applications involving cryptography.

Management of the variable keys for end-to-end encryption is not affected by the way a node is attached to a data processing network. A system mechanism selects and/or assigns a cryptographic key to be used for enciphering and deciphering data between communicating end users (or network nodes).

If one or more nodes in the system does not have an encryption capability or if encryption of only selected messages is desired, an additional system mechanism is needed to enable and disable the encryption function.

In either case, by integrating the cryptographic capability (logically or physically) into the network node, cryptographic operations become "transparent" to the end user.

Authentication Process

Authentication is a process which proves or serves to prove that someone or something is valid or genuine. In a computer system or communications network, authentication is an important part of good data security,

Authenticating a person's identity requires a special legitimacy test. A secret or nonforgeable parameter, supplied by the individual to be identified, is used in conjunction with an identification number. By checking the parameter's validity, a DP system can determine whether the identified individual is the person he claims to be.

Cryptography is a highly secure method for authenticating secret parameters (such as passwords). In fact, cryptography can be used by DP systems to authenticate any parameter stored in, or supplied to, the system.

Digital Signatures

A special authentication technique receiving significant attention today is the electronic digital signature. This approach has the unique property that a receiver can validate a sender's signature, but cannot create such a signature.

Used for data transactions, the signature is usually a computed function of (1) the message, transaction or document to be signed, (2) secret information known to the originator and, possibly, (3) public information known to all parties.

For a digital signature procedure to work, there must be enough information available for message and signature validation and yet insufficient information to permit either message or signature forgery.

Regardless of the method used, when implementing digital signatures, an initial written and hand-signed agreement is normally required between sender and receiver. The agreement contains a complete description of the procedure to be used, including either bit pattern listings required for validating signatures or the name and location of the registry containing those listings.

There are several cryptographic techniques for generating digital signatures using either conventional or public key algorithms. Presently, public key approaches, although considerably slower than a conventional algorithm, present an advantage because the frequent key generations normally required for a conventional algorithm are not necessary.

But whatever the application, cryptography is the only known practical means for protecting information transmitted through an exposed environment such as a communications network, be it telephone line, microwave or satellite link; and therefore it deserves wide attention.

The authors do research in cryptography for IBM. Meyer reportedly played a principal role in IBM's development of the algorithm that became the Data Encryption Standard.

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*Datapro Research Corporation's annual survey/1979

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A Store-and-Forward System

Air Carrier Bumps Telex for Message Switching

By David E. Hunt
Special to CW

Seeking to improve a user's transcontinental data communications with an alternative to common carrier dependence, the author pieced together a message-switching system supported by software developed for the British Post Office.

The age of electronic message delivery has begun, bringing faster and more flexible data communications than common carriers can currently deliver.

As a consultant, I installed and now maintain a store-and-forward message-switching system for an air freighter. The system switches messages between offices located near various U.S. airports.

Before getting the system, the client firm used a leased-line Telex service between major hub stations and a dial-up Telex service between smaller and foreign station. This method proved undesirable because:

- With the leased-line Telex, everyone on the circuit received every message typed on the circuit. Station personnel therefore had too much paper to sift through to find their messages.
- To reach stations not on the leased line, messages had to be relayed to their destinations. This meant someone had to sit down, dial the target station and retype the message — a time-consuming task, especially when circuits were busy or more than one destination was involved.
- At a given station, messages could not be prepared for transmission on the leased line whenever a message was coming in.
- The above problems forced users to send many messages by telephone — a costly, labor-intensive and inefficient means of communication.

Present Capabilities

The message-switching network has solved most of these problems. The combination of processor, software and terminals permitted:

- Selective routing of messages to specific stations along any leased line.
- Routing messages on a systemwide basis in order to broadcast messages of systemwide importance (for example, alerting all stations to lost shipments).
- Preparation of messages on a CRT terminal while incoming messages were received on a printer.
- Routing messages to several stations after sending the message only once.
- Establishment of special routing codes for key personnel within the company so messages to them could be routed to their destinations as they traveled from site to site within the network.
- Message storage as a precaution against losing valuable data in the event of terminal malfunctions. The stored messages can be delivered when normal operation resumes.
- Very fast message delivery. Usually messages on a leased line are routed and delivered to two or three locations on that line in less than a minute.

Aside from these benefits, station personnel are free from the drudgery of trying to get through when dial-up circuits are busy. Where dialing is required, the system allows automatic dialing and retries via the CPU.

Reliability Proven

Because the CPU and message-switching software chosen for the air freight client were originally developed for the British Post Office, the sytem was implemented with AT&T Dataspeed 40/3 terminals on a limited budget and with a minimum of long-term commitment.

After the initial hardware bugs were worked out, the system proved very reliable and was well-received by those who used it.

Since May 1978, the system has run almost continuously, with occasional pauses to perform hardware and software maintenance. The air freight forwarder uses this system as partial justification for a Federal Communications Commission permit to operate as a common carrier and thereby increase the scope of customer service.

A small staff can monitors problems, reroute messages and take corrective action to ensure rapid delivery of information. The system also allows the interfacing of such devices as other computers, word processors, optical character readers — not to mention a variety of terminal equipment.

Electronic message delivery will eventually fall within the realm of firms that currently carry documents from place to place. After all, if the British Post Office has such a system, the U.S. Postal Service could implement something similar.

What I see developing are carriers that supply not only the basic communications service, but extra services such as access to specialized data bases or wire services that tailor information into format suitable for analysis.

The hardware exists, the data bases exist, the wire services exist and, for some applications, the software exists. With a well-conceived product offering, proper planning and careful management, this new breed of common carriers can go a long way toward providing data on more of a real-time basis than possible with older technology.

Hunt is general partner with Kabat & Hunt, a computer service bureau in San Francisco.

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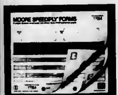

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CW 11-79

According to Pertec Exec

Cobalt Shortage Could Hike Drive Prices

By Howard A. Karten
CW Staff

First there was the oil shortage and then the paper shortage, followed closely by the paper clip shortage, the rail car shortage and the emerging shortage of gold. The latest one to hit the scene is the cobalt shortage.

The cobalt shortage?

Yes, a cobalt shortage of sorts is beginning, and it could affect DP users, according to William T. Chambers, division vice-president for peripheral marketing with Pertec Computer Corp. The material is used in voice coil positioners, which are an integral part uf the positioning arm mechanism of disk drives.

Perhaps as much as 80% of all cobalt comes from Zaire as a by-product of copper mining. The Zaire government has been through some turmoil in the past year, and as a result the price of cobalt has risen 400%.

This price rise means a bottom-line price hike of nearly $100 on Pertec's disk drives, Chambers said in a recent interview. That translates to nearly 3% of the $3,500 Pertec charges its customers when they purchase the drives in moderate quantities.

As a result, Pertec has started putting "precious metals" clauses in its contracts with customers to protect itself against unforeseen, sudden price increases. "Not all customers like them," he said, and not all vendors are using the clauses [CW, Nov. 19].

Part of the problem is that cobalt buyers must pay for the material on delivery, not on purchase. Although there has been no disruption of deliveries, the prices have risen.

Ceramic Materials?

Pertec has looked at the possibility of using ceramic materials in a redesign of the positioner mechanism, but there are two problems with that approach. First, the redesign effort — compounded by the fact that Pertec must stick to certain specifications in the products it sells to systems packaging houses — would take time and money. Secondly, that design approach might slow down the disks' access time.

Another major industrial user of cobalt is the loudspeaker industry. However, Chambers said he was not aware of any sort of "cobalt users group" which, by its size and resources, might ameliorate the problem.

There is no trading in cobalt futures, according to the *Wall Street Journal*, so Pertec and others are denied that price hedge, often used by other major consumers of materials traded on the commodity futures market.

Nor is cobalt the unly shurtage faced by Pertec and other companies in that geographic and manufacturing area, Chambers continued. There have been shortages in capaciturs and in finding qualified manufacturing and service people.

The result is that Pertec will not accept contracts with clauses calling for delivery within six months. "Larger customers understand and don't raise too much hell about it," Chambers remarked.

Minimal Risk, Optimal Return Seen Conversion Touchstones

By a CW Staff Writer

SILVER SPRING, Md. — The key question in converting to new technology is how to minimize the risk and optimize the return on investment, according to Nahum Rand, president of Rand Information Systems, Inc. of San Francisco.

Speaking at the recent Data Processing Management Association Education Foundatiun's Computer Systems Enhancement Symposium here, Rand cited several reasons to move to new technology.

First of all, the increasing volume of work has forced users to seek more capacity. The increasing demands of clients — end users — and more competition has also forced DP to consider new technology.

Other forces fueling the drive for new technology include changes in government regulations, new business opportunities and, sometimes, a lack of vendor support for a user's current hardware.

However, there are some planning guidelines on which users can rely to assist them in coming up with a good plan, Rand said.

A user considering a system migration or conversion should identify overall requirements, determining what is actually possible, he suggested. Then, after developing a conceptual system design and a detailed design, the user should specify what the new files, programs, data sources and interfaces will look like.

As part of this process, it is important to identify existing processes to be retained, as well as plan the conversion of existing systems. From there on, Rand said, conversion is pretty much a textbook exercise — planning development of new systems, converting retained systems, building and testing new systems and installing all components.

However, as part of this process, users may want to consider a series of smaller, incremental changes instead of one big one, Rand

(Continued on Page 55)

Kansas System Plays Big Role In Raising Funds From Alumni

Special to CW

LAWRENCE, Kan. — A mainframe here is helping the University of Kansas raise funds from its alumni. In fact, last year, the first year the system was in operation, membership in the school's alumni organization took its largest jump ever, according to university officials.

The school, which last year had an operating budget of more than $250 million, is state-supported. However, it depends heavily on additional support from alumni and friends to carry on its range of activities and programs.

Although the university has a broad base of alumni support — the number of active alumni totals more than 100,000 — the record keeping for that many individuals can present a problem.

Before it began using the present system, the school's alumni association had a manual file of 4- by 6-in. index cards to maintain information. "We were limited by the amount uf time it took to update records," according to Dick Wintermote, executive directur and secretary-treasurer of the alumni association.

(Continued on Page 52)

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System Helps School Get Funds From Alumni

(Continued from Page 51)

Inaccurate data, caused by the inability to keep current on such changes as addresses, marital status and deaths, can seriously damage alumni relations. "As we approached the 100,000-record milestone, the task of updating, retrieving and reporting from the files began to require more time and effort than our resources could provide," Wintermote recalled.

Files Automated

Officials discussed their problems with the university's Office of Information Systems, which resulted in a four man-year project to computerize the files. The system first became operational on an IBM 370/148, according to R. Alan O'Rear, assistant director of the Office of Information Systems and the alumni information system's chief architect.

The system was brought over to the university's 3M-byte 3032 when that system came in around August of this year.

The alumni information system is now being used to store such information as member's name and address; previous, preferred and nicknames; titles; and persons closely related to the member.

In addition, it stores information membership status, type of membership (full, annual or installment life) and whether the individual works for an employer that matches individual gifts.

One of the biggest benefits the alumni association has gained is rapid access to accurate data. "We can be up-to-date on any given day as our personnel can enter data directly on a CRT terminal. We can satisfy requests for information with the latest data, such as creating a mailing list that's not dated by the time its used.

"Also, and most important, we avoid alienating alumni and friends by keeping abreast of their current status," Wintermote said.

Another portion of the alumni system, the endowment segment, has also helped the school in strictly-money-raising functions, according to James Martin, vice-president for private support.

"We would, for example, maintain records on donors to our annual giving programs on an alphabetical, geographical and monthly basis. This meant that the same gift might be manually posted three different times.

"Obviously, while this kind of breakout was necessary to our purposes, it represented an unnecessary duplication of effort," Martin pointed out.

The system also allows the association to keep information on each alumnus in free-form text. For example, if an alumnus has received a particular award or position, that information can be noted and used in later fund-raising efforts.

The university was concerned about file security, officials said, so a series of codes and passwords has been built in. While there is a common sign-on, only certain people are allowed to perform file updates and accesses.

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System Handles Ticket Sales

Waiting Lines Shortened for Coast Tut Visitors

SAN FRANCISCO — A computer system played an important part in issuing tickets to the King Tut exhibition held here, recently.

The system, a 448K-byte Hewlett-Packard Co. 3000 Series II, was used to organize the ticketing process, which helped reduce the size of the waiting lines that occurred in other cities for the exhibition, according to two of the people closely involved with the operation.

"We wanted to eliminate the long lines, yet give purchasers access to the entire inventory of available tickets and times. At the same time, we wanted an approach that would provide the audit controls and reports necessary for financial accountabiltiy to the Museum Society and the Egyptian government," according to Jack Jacoby, direct marketing manager for the Emporium, a local department store.

"In our search for the best method of handling ticket sales, it occurred to me that maybe a fulfillment house [a company that does the processing and shipping for an order by a customer] would like to work on this project," so he began to scout for recommendations. Jacoby eventually contacted a local outfit, Merchandising Methods, Inc. (MMI).

MMI applied a familiar industrial and computer concept to the problem of satisfying as many choices as possible; yet avoiding long lines at the doors: load leveling. The limited capacity of the museum — 900 visitors per hour — and Tut's limited engagement — four months — made this imperative.

The first step in the process was distributing special order envelopes to area department stores. Jacoby and MMI deliberately chose this method over newspaper advertising to add a slight amount of difficulty to the process of getting a ticket.

"If we'd run an ad, we would have gotten a response we couldn't handle, Jacoby explained.

Customers ordering tickets had to make choices in three areas. The first orders entered in the system got their first choice. When a particular time slot filled up, the computer gave the customer his second choice and so forth.

The computer did the actual ticket printing.

Interesting Problem

One interesting problem occured about a week into the ticket-printing effort. The software had been written by a local consulting firm and test routine, erroneously left in the programs, did not keep proper track of the inventory. At that point, some 23,500 tickets had been printed.

"Panic? That's a mild word for it," Jacoby recalled of the incident.

To get around the problem, MMI and Jacoby decided to change the color of the tickets and reissue them. Customers with incorrect tickets received new tickets along with an explanatory letter, informing them the old tickets were no longer valid.

Mass Storage Unit Gets Price Cut

WALTHAM, Mass. — Honeywell, Inc. has announced a 22% price reduction on its MSU0500 mass storage unit. The price cut, for both purchase and rental agreements, is effective immediately.

The new purchase price of the device, a dual, fixed pack disk unit, is $37,000. The new rental price is $1,028/mo, down from $1,115/mo.

Maintenance prices remain unchanged at $164/mo, officials said.

up and delivery.

Problem Data is one thing there's no shortage of. The business problem today is getting the right data to where it's needed in a form that's useful.

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Hardware Monitors Help Services Firm. .

By C.W. Mead
Special to CW

TAMPA, Fla. — Accurate, long-range capacity planning is helping GTE Data Services, a subsidiary of General Telephone & Electronics Corp., forecast growth and budget DP costs accurately. Measurements derived from both hardware and software tools help us avoid overcapacity as well as overloaded systems.

We have developed guidelines for acquiring additional disks, tapes, CPUs and other hardware. Many of those guidelines have been made possible by five Tesdata Systems Corp. MS-88 and one Tesdata 1155 hardware monitors permanently installed at our major locations.

In some cases, these two-year and five-year forecasts have proven accurate to within a week or two.

The guidelines measure the relevant dimensions for each class of hardware — speed and capacity for disks, speed and density for tapes, instruction rates and main storage size for CPUSs. In most cases, these guidelines are based on our measurements.

However, when we don't have our own figures, we refer to published material from other performance measurement groups, but rarely do we rely on vendors' specifications.

Why Go Formal?

Two factors forced us to use formal measurements of capacity. First, since our founding 12 years ago, our growth has been extensive, so it is important to control costs. Second, we have 11 separate data centers throughout the U.S., so the guidelines apply to all these installations.

To generate these guidelines, we continually monitor many sensitive indicators, such as millions of instruction/sec (Mips) in problem and supervisor states, disk subsystem performance, I/O counts, CPU busy and wait, channel or control unit busy and concurrency of activities. These overall measures are then analyzed by shift and by month.

Measurement data is also compared across the various data centers to determine the impact of different workloads. In addition, data from different measurement tools within the same data center — for example, Resource Measurement Facility (RMF), Systems Measurement Facility (SMF) and hardware monitor data — are calibrated to each other to ensure repeatibility of interpretation of results.

We continually supplement our guidelines by measuring new devices and validating the integrity of old guidelines by reconstructing the measurement experiments that originally formed their bases.

We are particularly careful to look at the varying levels of impact that the different segments of our workload can have on hardware performance. For example, our hardware planning system (essentially a linear model) takes into account scheduling considerations, the type of application and whether it is batch, data base or interactive. We can factor in loading levels achieved during peak periods so the ceilings of our capacity guidelines allow for cost-effective decisions.

Good Data Critical

But no one achieves good predictions without good data and a proven model. Among the types of data we use are system statistics, user-generated projections of work load requirements (couched in "natural forecast units") and implementation schedules of new applications.

Our system produces graphs that plot expected loading levels against to-

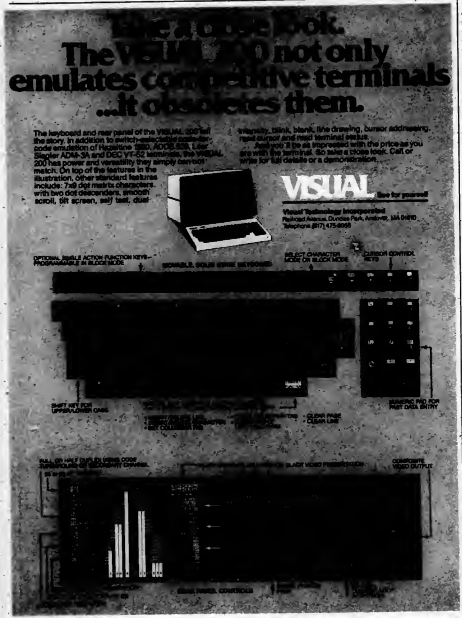
A Good Example

FORT WAYNE, Ind. — GTE Data Service's data center here is a good example of how capacity planning can pay off, according to company officials.

This data center experienced a 300% work load increase during the past three years — a typical increase, according to officials. When an IBM 3033 was installed this past August, it was just in the nick of time; existing CPU capacity had been exhausted.

However, that planning effort began several months earlier. If the 3033 had come in just a month late, customer service would have suffered. If it had come in a month early, the firm would have been paying for extra power it didn't need.

Similar results have been obtained at the firm's Erie, Pa., site and company headquarters in Tampa, Fla., officials noted.



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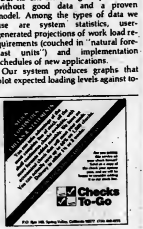

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tal capacity and actual utilization levels achieved at each data center. We thus have both individual breakdowns of trends as well as a corporatewide picture of hardware usage and projected demands.

Natural forecast units are figures directly germane to a customer's business. For telephone companies, these are the number of accounts, number of telephones or number of employees.

The customer's input is then in his own business terms, but is converted to our DP requirements (CPU hours, tape drive hours, etc.).

Our DP staff combines the individual data center plans into a consolidated plan. This makes it possible for the staff to make trade-offs so that, for example, hardware released from one location can be placed in another data center.

Sometimes we find we must do a reiteration of a plan when application systems implementation schedules change or when modifications occur in major project estimates of resource consumption. Although we expect some fuzziness in our five-year projections, we have found that short-term plans — from six months up to two years — are quite accurate, and we get few major surprises in the short term.

Beyond two years, exact forecasting becomes more difficult because there are several imponderables. If coding of an application has not begun, the resource requirements cannot be easily quantified, for example.

Further, it is difficult to predict beyond two years the impact of new technology. We can live with this, nevertheless, and allow for some contingencies.

Even given these limitations, five-year forecasting is valuable. Long-term planning also takes on the added dimension of dynamic forecasting because of the frequency with which "what-if" questions can be introduced into the acquisition scenario by corporate management as part of the consolidation process. This has the effect of allowing all possible alternatives to be sorted and tested.

One of the particularly interesting things about hardware planning, we have found, is this: You can put a price tag on bad planning fairly easily — the cost of major equipment installed before it's needed, the cost in lost revenue caused by providing inferior service. But it's nearly impossible to apply a specific dollar figure to the positive effects of good planning.

Mead is DP staff manager for capacity planning with GTE Data Services.

Conversion Keys Detailed

(Continued from Page 51)

pointed out. Moreover, a long-term systems plan may not work because needs change as a function of time.

One method of change is what Rand termed "system migration," or migration in stages with "migration windows" to allow modification. This provides manageable, orderly stages of growth, permitting modifications with minimum commitment.

In its own consulting practice, Rand's firm, which specializes in conversions, has made mistakes, he said. However, the important thing is that each time it added to its knowledge, so that in future efforts it would know how to anticipate the pitfalls.

Not Technical Problem

"Conversion is often more of a management problem than technical problem," Rand emphasized, explaining that the technical problems often are finite, better understood and can be quantified.

Among the conversion management problems are that there are many interdependent tasks, including those of sequencing and scheduling, dealing with a large volume of materials, maintaining both uniform standards and quality, and conducting parallel operations.

Perhaps one of the more important management problems is that of personnel morale, he stressed. In one study conducted by the Navy, conversion problems were found to contribute significantly to the high attrition rate.

One of the key things DP managers should do in conversion efforts is to educate their managements, according to co-panelist Ben Bennington, manager of Rand's Transformation Services Division.

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Group Trades 370/135 for M80/4

Pilots Switch CPUs, Throughput Soars 300%

By a CW Staff Writer

WASHINGTON, D.C. — The Airline Pilots Association (Alpa) has achieved a 300% throughput increase by replacing an IBM 370/135 with a Magnuson Systems Corp. M80/4, according to Alpa officials.

The system is also approximately 30% faster than an IBM 370/148 the firm evaluated, they added.

The replacement came after the group made a six-month investigation of plug-compatible mainframes. The Magnuson system has more memory — 2M bytes — than the 608K-byte system it replaced.

IBM had submitted a proposal to "beef up" the firm's 135 until the 4331 became available in September 1979 and then exchange the 4331 for a 4341 later, according to Jim Barnett, DP director for the association.

A growing workload forced the association — a kind of union for pilots — to seek more capacity. "In the interim period between [the 4331 and 4341], we would have had to add staff to provide a third shift so that we weren't interfering with daytime on-line activity," Barnett recalled recently.

"IBM's proposal also would have added $30,000 yearly to the association's budget," he commented.

Alpa set up a two-phase investigation of plug-compatibles. "The first step was to take a look at some of these machines. We evaluated Itel Corp. and Magnuson Systems Corp. machines and Control Data Corp.'s Omega systems.

"We also talked to Amdahl Corp., which started talking about its low-end system, which was about 20 times as big as what we'd had," Barnett recalled with a chuckle.

Members of Alpa's DP advisory committee — three pilots and the general manager of Alpa — visited the headquarters of each vendor and benchmarked each system "comprehensively," Barnett claimed. The benchmarking included three separate runs of processing — one for the day shift, one for the night shift and one for a combined shift.

"We took a series of tapes and loaded them onto 3330s. We got each vendor to modify a system for us as necessary, to provide us with the proper terminals, disks and tapes. They didn't charge us for that," he said.

Next, the association representatives evaluated the architecture of each piece of equipment, as well as the processing time from the benchmarks. The three firms came out quite close on the benchmarks, Barnett said.

The association also called customers whose names the vendors supplied. One aim was to evaluate the service provided by the vendors in terms of procedures, methods for providing service and measuring satisfaction, the DP manager explained.

Taking unusual pains to ensure compatability, the firm also ran all its software on the benchmarked systems.

Second Phase

The second phase of the benchmark was to compare the survivor of the Phase I benchmarks with IBM 370/145 and 148 systems. When the association compared the Magnuson system with the IBM systems that were bid and added in the price consideration, Magnuson was the easy winner, Barnett said.

"We chose it because we liked the vendor, and Magnuson makes its own equipment. Also, its equipment was more 'state of the art,' we felt. We were right at the time frame when we didn't know what the 4331 and 4341 were.

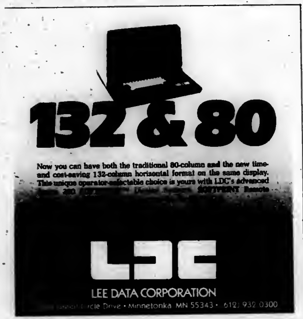
"So, basically, we delayed our presentation until they were announced because we thought at the time, 'Well, we selected Magnuson to compete against [IBM] because we feel Magnuson is in the best position to deal with the impact of any announcemeot by IBM' — and it turned out to be the truth, too. You know what happened to Itel," he said.

Alpa's need to expand its capacity came about in part because of long-range plans. "We needed more processor power to interact during those hours when demand was greatest — 9 a.m. to 9 p.m. — and our long-range plans also included complete automated office service for certain field locations. In effect, we're moving into distributed processing, and the M80 is the key," Barnett said.

The association uses its systems for the standard administrative applications — union matters, dues, life insurance, etc. In addition, it performs one unusual function in parallel with government agencies: it analyzes flight recorders from crashes or other accidents tu find out, on its own, what caused the accident.

"That's part of the representation we provide for pilots, to make sure they don't get unfairly blamed for errors," Barnett said.

Alpa's future plans call for possibly upgrading the 2M-byte system to 4M by the end of 1980, probably with a larger Magnuson system.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Food Broker Beefs Up Order Processing

Special to CW

MONTEBELLO, Calif. — A regional food broker here is using a trio of small business systems to supply meats, produce and groceries to stores throughout northern and southern California and Arizona.

"Before we installed our in-house computer system, all of the orders coming in by phone were handwritten by the order takers and then typed," Ron Dresher, marketing manager for Bradshaw, Inc., said. The typed orders were then rechecked with the written order for verification and either mailed, phoned or teletyped to food supply customers.

Copies of orders were then sent to a computer service bureau where the necessary information was manually keypunched for entry to a computer. From this data, commission calculations and a limited number of sales and financial reports were then prepared and sent back to Bradshaw.

"An obvious disadvantage was the labor involved in manually typing the orders, plus the additional time it took to get the order information to the principal," Dresher pointed out.

"However, an even more critical problem was that the manual system did not provide a means for capturing sales data in a form that could be used by a computer for generation of management reports and calculation of commissions."

Tri-CPU System

The Bradshaw in-house system utilizes three Digital Equipment Corp. Datasystem 310s. Each system has 32K bytes of main memory, a dual-diskette drive supplying 67K bytes of mass data storage, a VT52 CRT terminal for data entry and a 180-char./sec LA180 printer.

The small computers also have the 2780 interface option, enabling them to be linked directly with two large IBM 360 processors located in a remote facility.

In addition, the interface capability permits transmission of data to an in-house Plus-TWX system, which generates tape cassettes used for automatic teletyping of orders to those principals who are equipped to receive TWX transmissions.

The software was developed under sponsorship of The Performance Group (TPG), a cooperative organization of major food brokers, of which Bradshaw is a charter member. The order-entry and management-information system is the result of a joint developmental project conducted for TPG by Tudor Co., Inc., a Los Angeles-based management consulting firm specializing in the field of consumer package goods, and Knox Data of Van Nuys, Calif., an OEM which supplied the Datasystem 310 and supports the software system.

Fast Order Entry

As customer orders are received from the sales department, operators enter them into the DEC Datasystem 310 CRT terminal keyboards. An order form displayed on the screen serves as a guide.

Upon entry of the principal's identification code, the system automatically structures the order form to meet the principal's requirements, Dresher said. The free-floating format of the system permits use of virtually any order form, including the National Food Brokers Association standard.

Operators are required to enter only minimal data, including customer and principal codes, item codes, quantity and price. The CPU automatically supplies customer and

(Continued on Page 60)

DG Entry-Level Eclipse Mini Aids Scientific Applications

DG's Eclipse S/140 Entry-Level Mini

By John Whitmarsh
CW Staff

WESTBORO, Mass. — Aiming "to unlock doors and expand our customer base," Data General Corp. last week added a high-performance, entry-level minicomputer to its Eclipse scientific line.

The Eclipse S/140 incorporates a redesigned CPU, a 128K-byte expandable memory and two floating-point unit (FPU) options that reportedly increase performance over the bottom-of-the-line S/130; at $16,500, however, the S/140 costs 20% less than the S/130, the company said.

Introduction of the S/140 is the second major product announcement from DG in recent weeks. Two weeks ago the company introduced its Xodiac network management system [CW, Nov. 12].

The S/140 can share hardware and software resources with other Eclipse systems in the Xodiac network that run under DG's Advanced Operating System (AOS), but the new computer is intended primarily for a wide range of scientific applications from number crunching to process control to signal analysis.

The S/140 features a single-board, microprogrammed CPU whose speed is enhanced by a memory Pre-Fetch Processor (PFP) and standard four-way interleaving on main memory that accelerate program execution times, the company noted.

Three Configurations

The S/140 is available in three configurations. The basic S/140 comes with 128K bytes of MOS memory and costs approximately $16,500. The four-way interleaving on all memory boards delivers a memory cycle time of 400 nsec.

Memory is expandable in 128K- and 256K-byte increments up to 1M byte and is supported with a standard Memory Allocation and Protection (MAP) unit. MAP is said to support privileged instructions, I/O device protection and main memory write and validity protection in a multiuser environment..

The basic S/140 costs approximately $16,500.

The S/140 with 256K bytes of memory, console printer, 4-line asynchronous communication multiplexer, four CRT displays, 12.5M-byte disk subsystem, 300 bit/in. magnetic tape subsystem and cabinet sells

(Continued on Page 60)

Mini Streamlines Planning

Cruise Liner Tightens Ship

Special to CW

MIAMI — Champagne, gourmet meals, casinos, entertainment and sun — lots of sun — are all arranged for the vacationer by a cruise line's minicomputer-based travel system.

Carnival Cruise Lines (CCL) is a seven-year-old firm based here with an annual passenger revenue of approximately $100 million. CCL has three ships and more than 150,000 vacationers annually on seven-day cruises from Miami to the Caribbean.

According to CCL's DP manager, Jim Bussey, cabin assignments, payments and option expiration dates (the date cabin reservations are canceled because of nonpayment of balance) for each sailing were formerly recorded manually in what are called berthing books. But because different departments are responsible for performing these tasks, the books were in constant demand.

"There was a real bottleneck," Bussey said. "Reservationists needed them to book passengers. And cashiers had to record payments, making the books unavailable for reservationists, who just had to wait. This took them off the booking phones."

As a result, "books were flying all over the place. And there was lots of yelling," he added.

Feasibility Report

Because the berthing book method was time-consuming and inefficient, CCL decided to prepare a feasibility report to find a better method of travel planning.

A Los Angeles tour operator with which CCL worked, Galaxy World Tours, told Bussey about its computerized travel system — a Data General Corp. Eclipse.

"It wasn't a cruise system," Bussey noted,

(Continued on Page 58)

Travel System Helps Cruise Liner Tighten Ship

(Continued from Page 57)

"but the basics were there, so we didn't have to look any further."

A DG OEM, Integral Business Computing (IBC), designed and installed Galaxy's travel system and other Eclipse minicomputer-based systems for the wholesale and retail travel business.

IBC modified its travel system to suit CCL's cruise application and installed an Eclipse C/330 with 512K bytes of memory, two 96M-byte disks, one 10M-byte disk, two printers and 35 Dasher CRT terminals at CCL's Miami headqoarters. The system has been operational since November 1978.

The minicomputer uses DG's real-time disk operating system (RDOS), and programs are written in Fortran. Fortran reportedly incorporates the real-time multitasking capabilities necessary to support the demands of CCL'a travel office.

Training and Conversion

Training and conversion at CCL were conducted together. As soon as the system was operational, reservationists started entering data from the berthing books into the computer.

"By the time they were halfway through the books, they were pretty familiar with the technique and programs. So when they began entering data from the reservation phones, they had no trouble," Bussey said.

When an individual contacts a travel agent to book a Caribbean cruise, that agent then calls CCL. Twenty reservationists use the CRT screens to display "sailing availability" information, which lists the cabins available on the ship scheduled for the desired destination. There are 12 categories of cabins, ranging from center ship, bunk-bed style cabins to upper-deck suites.

In addition to cabin categories and rates, the display includes the cruise rate and the cruise-plus-air rate.

When a cabin is booked, reservationists turn to the CRT terminals again to enter the travelers' names and assign the appropriate cabin number, and cashiers note the deposit payment. Line printers generate a reservation confirmation mailer and a deposit receipt, which are forwarded to the travel agent.

Groups of travelers are handled in the same fashion, but a block of cabins are booked as opposed to just one. Later, names are entered and assigned to cabins and deposits are noted in the same way.

Automatic Cancellation

The balance of the payment is due 30 to 45 days prior to sailing. Under the old method, the reservationists paged through the berthing books checking each passenger's file to determine which reservations were not paid in full and therefore canceled.

The travel agents had to be told and the books had to be corrected to show a vacant cabin. This took a lot of time, Bussey observed.

Now, the Eclipse automatically cancels the booking, and reservationists always know exactly which cabins are taken and which are not.

Every detail pertaining to every passenger's trip is recorded in the system. CCL arranges air or ground transportation to Miami, limousine service to and from terminals, hotel accommodations and even car rentals, if requested. All of this information is stored in the Eclipse and can be referred to with a few simple keystrokes, Bussey continued.

Every canceled cabin can now be easily rebooked, but more importantly, the system permits CCL to book more passengers, substantially increasing the firm's revenues, Bussey added.

Sales Inquiry

CCL also uses the system to inquire about sales. Bookings are usually made six months to a year in advance of sailing. Formerly, it took a full week to count all these bookings one by one in the berthing books. Now it takes as little as two hours to determine how many passengers have been booked per ship, the DP manager said.

Previously, the berthing books were handed over to a service bureau four days before departure. The bureau would keypunch the passenger data listed in the books into a computer to prepare this report. But while the service bureau had the books for four days, CCL had to make do without them.

The service bureau is currently handling accounting work for CCL; but Bussey said he'd like to add that application to the Eclipse. Expansion to a dual system, or the addition of an Eclipse M/600, is being considered as well, because at least one new ship will be added to the fleet by December 1981.

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System Choice Based on Flexibility

Turnkey Helps Cutlery Importer Carve Time

By Victor Matz
Special to CW

DANBURY, Conn. — Minicomputers could be a boon or a bust for importers. For us, it is a boon because we made the decision to select a flexible minicomputer system, oriented to our business, rather than one which was rigid.

Kirk & Matz, Ltd. not only imports a variety of gifts but also manufactures its own silver and cutlery, brass candle holders, solid brass trays and other items. The company handles more than 2,000 different products and sells them to gift shops, jewelry stores and some department stores. In fact, we have 34 manufacturer's representatives serving the gift shops alone.

Time Problems

When one recognizes the magnitude of the problems of manually processing inventory, importing, representative relationships and billing on so many items for so many retailers, it is easier to understand that until a short time ago we were beset by time problems which could not be overcome even by increasing our staff.

We had four full-time people handling order entry and receivables alone. And I spent better than 50% of my time on inventory, with my working days starting at 5:30 a.m. and ending about 11 p.m. at home.

During the winter of 1977, we started attending DP seminars on small business systems and the alternatives to manual operations.

About the same time, minicomputer systems in general were lower in price and providing more capabilities. We waded through dozens of system demonstrations by IBM, Burroughs Corp, NCR Corp., Turnkey Sales & Leasing, Inc. and others.

Making a Choice

We asked for and received proposals on what applications, what hardware and what flexibility we would have available to us for what cost. Our main concern was development of the right software for our applications and selecting a vendor which could supply that software on a turnkey basis.

After months of study, we selected Turnkey Sales & Leasing, Inc. to write the software and accepted its recommendation of a system based on a Microdata Corp. Reality minicomputer.

The system we selected is configured with 32K bytes of core memory and 10M bytes of disk storage, three CRT terminals and a 90 line/min printer. The printer is now being replaced by a 300 line/min unit printer to generate more reports from the system.

Kirk & Matz's computer handles every phase of the import accounting operations.

Order entry is an important system application. When an order is input, a two-part pick form with packaging and carrier information and shipping label is generated. Simultaneously, the inventory is automatically adjusted.

The system does not reject orders because of incomplete inventory. Partial shipments are made with "balance to come" noted on the invoice our accounts receivables files and representatives' commissions are updated to correspond with the entered transactions.

A problem which plagues most importers and is extremely time-consuming is "costing." With the wide fluctuations in currency exchange — which is considerably changed from what was rather static information — the profit picture used to be unclear for some time.

Often, it took three weeks to determine manually what the profit margins were on previous shipments. With our turnkey system, it now takes a little more than one day.

A good part of the success we're enjoying with the system is a result of personal involvement in helping Tusnkey Software, Inc., a subsidiary of Turnkey Sales & Leasing, design the software. As a result, I'm more familiar with the system.

Best of all, we did not have to change any of our forms — invoices and statements are the same.

In addition, with Turnkey's cooperation, Kirk & Matz people went through all of the operating procedures step-by-step and became reacquainted with all phases of our business.

Matz is vice-president of Kirk and Matz, Ltd.

Add-On Out For PDP-11s

SANTA ANA, Calif. — An add-on memory with access times of 210 nsec or 275 nsec for use with Digital Equipment Corp. PDP-11 processors has been introduced by Computer Interface Technology (CIT).

The CMS-11 memory's arbitration circuit enables users to get a 30% increase in throughput over DEC or other compatible memory because of higher speed access and cycle times, a CIT spokesman claimed.

Use of the CMS-11 memory is also said to eliminate the need for comparable cache memories. Cache memory, which is usually a 4K-byte module, often costs more than CIT's 128K-byte board, the spokesman claimed.

The CMS-11 series is available with or without parity in 64K-, 96K- or 128K-byte configurations.

The 64K-byte version without parity, without battery backup and with a 275 nsec access time costs $1,395. The same configuration with a 210 nsec access time costs $1,695.

The 96K-byte version with all options and 210 nsec access time costs $2,295, and the 128K-byte version with all options and 210 nsec access time costs $2,695.

CIT is located at 201 W. Dyer Road, Santa Ana, Calif. 92707.

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DG Adds Entry-Level Eclipse to Scientific Line

(Continued from Page 57)

for approximately $46,000.

The S/140 with 512K bytes of memory and hardware FPU, console printer, 50M-byte disk subsystem, 800 bit/-in. magnetic tape, 300 line/-min printer, 4-line asynchronous multiplexer, four CRT displays, one synchronous communication line and cabinet sells for approximately $88,000.

The older, less powerful S/130 cannot be upgraded to an S/140, DG mentioned, adding that it has no intention of discontinuing the S/130, "the most popular Eclipse in volume and user acceptance."

Rather, the S/140 is designed to "overlay" the 130 in price and performance to provide expanded processing capabilities where the 130 was only "marginally proficient."

Scientific Applications

Designed for scientific environments, the S/140 emphasizes reliability through such features as automatic diagnostics that test the CPU, memory and I/O bus operations. The system also includes error checking and correction and a battery backup unit as standard equipment.

Error checking and correction on the system is implemented on a second board in the CPU. The system can detect and correct single-bit errors and detect multiple-bit errors to maintain data integrity. During power outages, the battery backup unit provides power to a single 256K-byte memory board for up to 90 minutes, the company said.

All Eclipse operating systems, languages and utilities support the S/140. The AOS provides resource utilization in a multiuser environment, while the Real-Time Disk Operating System (RDOS) provides optimal character response characteristics with foreground/background memory management of single and multitasked operations, the company noted.

Users have a choice of two floating-point options. A hardware FPU is intended for very high computational performance, while a firmware-implemented floating-point instruction set is available for less demanding computational throughput.

The hardware FPU, implemented on a separate board, can perform a double precision multiply in 9.2 nsec, according to the company.

Broker Beefs Up Order Processing

(Continued from Page 57)

principal names and addresses; item weight and volume and standard shipping instructions; it then extends the per-unit prices and totals the columns.

As the orders are entered, the operator visually checks the data on the CRT screen for accuracy and makes corrections as they are needed, Dresher continued. The system also has an internal editing feature that automatically rejects incorrect principal or customer numbers, product codes and other invalid data.

The information is accumulated on the diskettes and those orders that are to be mailed to principals are periodically printed on the LA180.

For principals equipped to receive automatic TWX transmissions, the orders are transmitted from the Datasystem 310 to the Plos-TWX unit, which is connected to the teletype transmitter. There they are recorded on tape cassettes and at predetermined times are automatically transmitted to the principal.

"The computer eliminates much of the manual effort in order entry, such as keying in redundant identifying data and extending and totaling prices," Dresher noted.

"The system now handles up to 250 orders a day [and] assures us of a complete return on our computer hardware investment in about three years."

Management Reports

However, the availability of more timely and detailed management reports is where the system really pays off, Dresher said.

Bradshaw has the capability of obtaining daily sales reports directly from the Datasystems, such as overall summaries of sales by customer or by principal. For more detailed sales and accounting reports, the day's transactions are accumulated on the diskettes.

At various times during the day, the information is transmitted directly to the remote 360 installation. Each month, the major detailed reports are processed in batch mode by the CPU.

Up to 29 different management reports are available through the system, Dresher stated. These can include an overall statistical analysis summary and statistical analyses by principal and by customer, which indicate case sales and dollar sales by period-to-date and year-to-date.

In addition, the sales reports are broken down according to Bradshaw's various sales modules or merchandise categories.

"We presently are developing an additional module for our system which will allow us to do an even more effective job of measuring the performance of every one of our salespeople against budget and their individual sales, distribution and advertising objectives," Dresher said.

SSI Unveils Printers

FORT LAUDERDALE, Fla. — Southern Systems, Inc.'s line of impact printers, operating from 200- to 600 line/min, are now available in a serial mode and are capable of receiving from minicomputers as far away as 2,000 ft, as opposed to the traditional 50-ft limit.

Operational through a modem or through direct-connect twisted pairs of wires, the printer systems function with "a wide range of minicomputers" via telephone lines, according to a spokesman.

Reportedly providing low-cost remote printing without any need for differential drivers/receivers or other cables, the SSI-22 serial interfacing may be used with the firm's complete line of high-speed impact printers.

Included in the firm's line are a 200 line/min impact matrix printer, 300- and 600 line/min band printers, the SSI 2200 printer series including 300- and 600 line/min drum printers and the 600 line/min Chaintrain unit.

In the serial mode, the 200 line/min impact matrix printer costs $4,000; the 300 line/min band printer costs $6,000; and the 600 line/min band printer costs $8,500. The 300 line/-min drum printer and the 600 line/min drum printer cost $8,000 and $13,000, respectively, while the 600 line/min Chaintrain costs $14,000.

Southern Systems, Inc. is located at 3000 N.E. 30th Place, Fort Lauderdale, Fla. 33306.

Correction

The correct address of Local Data, Inc., manufacturer of the Quiet 300 line printer [CW, Nov. 12], is Suite 706, 2710 Toledo St., Torrance, Calif. 90503.

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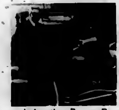

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Shipments of Floppy Disk Drives Double

MOUNTAIN VIEW, Calif. — This year's worldwide shipments of all floppy disk drive configurations will be nearly double those of 1978, a recent industry report predicted.

Worldwide revenues for flexible disk drive revenues for all manufacturers, which totaled $477.4 million in 1978, will grow at an annual increase of 39% and reach $1.77 billion by 1982, according to *1979 Disk/Trend Report* estimates. OEM sales will provide 43% of worldwide floppy drive revenues this year.

Total unit shipments for all floppy formats are projected at 1.448 million drives for 1979, rising to 3.9 million drives by 1982.

However, the unit value of shipments can vary widely, depending on the type of drive. For example, 8-in., two-sided drives are expected to supply only 27.7% of worldwide shipments in 1982, but 51.5% of total industry revenues. On the other hand, 5.25-in., one-sided drives will generate 30.5% of shipments, but only 15.6% of worldwide revenues, the report projected.

Decline of 8-In. Drives

While 8-in., one-sided floppy drives are expected to represent about half of all unit shipments this year, *Disk/Trend* sees a decline in the number of units produced starting in 1981 because of competition from other configurations.

A surprise to vendors has been the dynamic growth rate of 5.25-in. floppy drives, the report noted. Shipments for these will reach 488,500 units this year, up a whopping 282% from last year. By 1982, 2.2 million units are expected to be shipped.

Although one-sided, 5.25-in. floppies will be dominant in 1979, by 1982 two-sided 5.25-in. floppy drives will nearly equal the shipments for one-sided drives, according to *Disk/Trend*.

Despite well-publicized functional problems with 8-in., two-sided drives, they are forecast to reach worldwide shipment levels of 236,400 units this year. Major increases are anticipated from IBM, U.S. manufacturers of OEM drives and foreign manufacturers.

The entire *1979 Disk/Trend Report* is priced at $825. It consists of two sections: one on flexible drives, priced at $385, and one on rigid drives, priced at $550, available from James N. Porter, 1224 Arbor Court, Mountain View, Calif. 94040.

CI Notes

DEC to Add 16 Stores

MAYNARD, Mass. — Digital Equipment Corp. will open nine more retail stores for its small business computers and word processing systems by the end of the year.

When these stores open, DEC will be operating a total of 20 stores, all started within the past 16 months.

"By far our largest constituency to date has been professional and service organizations, including accounting and legal firms, but we see an increasing number of such diverse groops as religious organizations, small manufacturers and retailers," Gerald T. Moore, vice-president of DEC's Retail Products Group, said.

January Seminar to Focus On Captive Semi Makers

MOUNTAIN VIEW, Calif. — The production of semiconductors by DP manufacturers is becoming a trend, according to Howard Z. Bogert, director of technology for Dataquest's Semiconductor Industry Service.

These captive semiconductor makers are finding that the value added by producing their own very large-scale integration components offsets the capital equipment cost-per-wafer start, Bogert said.

An evaluation of captive semiconductor makers will be a new session featured at the Semiconductor Equipment and Materials Institute, Inc.'s Jan. 27-30 Information Services Seminar in Newport Beach, Calif. Dataquest, a Cupertino-based market research firm, will conduct that session.

Further information on the seminar is available from the institute at Suite 212, 625 Ellis St., Mountain View, Calif. 94043.

Supershorts

Xerox Corp. has transferred the marketing responsibility for disk memory products produced by Diablo Systems, Inc. to Century Data Systems. The transfer will give Diablo and Century Data Systems customers a single source for disk products and also allow Diablo to concentrate on the development of printing products, Xerox said.

The UK's Department of Industry is contributing half the cost of a study to determine the feasibility of creating a National Microcomputer Center. The study is being sponsored by the National Computing Center, which is soliciting views on the need for such a center and the services.

Foundation Gets Funds to Place Handicapped in Electronics Jobs

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The Electronics Industry Foundation recently received renewed federal funding for its program to place handicapped persons in electronics industry jobs.

Aided by a $325,000 U.S. Labor Department contract, the foundation hopes to fill at least 300 positions with handicapped workers by the end of January 1981. Some 270 people have found jobs through the Project With Industry program since its inception in January 1978, according to the project's national director, Carol A. Dunlap.

The foundation, part of the Washington-based Electronics Industry Association, provides staffing and operational financing for the approximately $650,000 project, Dunlap said. The program is also supported by the Department of Health, Education and Welfare (HEW).

With a staff of 16, the project has offices here and in Los Angeles, the San Francisco Bay area and in Massachusetts. Offices will soon be opened in Minneapolis.

One of the project's objectives over the next year and a half is to identify 30,000 job openings in the electronics industry. Approximately 12,500 openings have been identified to date and handicapped workers placed with such firms as Hewlett-Packard Co., IBM, ITT and Ampex Corp.

Dan Sheehey, field operations supervisor, explained that the foundation is seeking job openings in all types of skilled positions in the industry, including engineering, systems design and programming and in clerical and administrative positions.

Finding industry openings for untrained persons has not been too much of a problem because some of the companies have trainee positions, he said. Nevertheless, it has been

(Continued on Page 63)

STC Head Sees Users Protecting Investments in IBM Software

By Marcia Blumenthal
CW Staff

HOUSTON — "Software makes obsolescence slow," and the computer business is based on software, Jesse I. Aweida, chairman and president of Storage Technology Corp. (STC), stressed here recently.

"Users have an investment in IBM software and no one — not even IBM — is going to make them change. The software conversion [from IBM 1400 to 360 equipment] was so horrendous that no one wants to do it again," emphasized.

Looking to the computer industry's horizon, Aweida sees a trend toward the expansion of current products through the addition of intelligence and software compatibility, rather than a new generation of hardware. Users are beginning to view their DP gear as capital equipment: "They will use it until it wears out."

Although computer power is growing at about a 33% rate compounded annually, users are now more interested in increased functions for their present systems than in power, he maintained, concluding that this trend will have a stabilizing influence on the industry.

A polished speaker, Aweida gave his views on the future of the industry and in particular its disk subsystem segment to a group of computer dealers attending the annual meeting of the Compoter Dealers Association here recently.

Increases in integrated circuits' density and functions will create an expanded role for disk subsystems, he predicted. Large-scale

(Continued on Page 62)

Prices Fixed?

HOUSTON — Like IBM, Storage Technology Corp. (STC) has fixed price lists for equipment and does not undercut the prices quoted to customers by dealers in order to conclude sales, STC Chairman and President Jesse I. Aweida said here recently.

Moreover, he stated, the company does not charge additional maintenance fees when dealers transfer equipment from one user to another unless the equipment was warehoused for a substantial amount of time prior to installation at the new site.

Computer dealers attending the annual meeting of the Computer Dealers Association pressed Aweida about what they called STC's apparent practice of varying prices to take sales away from dealers. While happy to hear Aweida's public statement about fixed price policy, several dealers contended that STC does not adhere to that policy.

International Recruitment Aided

SAN FRANCISCO — A U.S.-based DP consulting firm and a European information processing services firm have formed an international affiliate to recruit qualified DP management personnel for U.S. companies overseas.

Inforama, headquartered in Paris, and International Computer Technology Corp. (ICT), headquartered here, have formed BGI, a company that will help both American and European computer companies find qualified personnel when setting up a foreign subsidiary.

Howard Bromberg, president of ICT, is the American director of BGI. His European counterpart is Robert Guillaumot, Inforama president.

BGI will help manufacturers, software firms and users locate top management and sales and technical management.BGI will specialize in recruiting personnel in France, Switzerland, Belgium, the U.S. and the UK.

In the U.S., BGI will operate out of the San ICT's office at 321 Bush St., San Francisco, Calif. 94104.

BGI has also established an office near New York City.

Users Seen Protecting Investments in Software

(Continued from Page 61)

integration technology will be used not only in the host processor, but will be distributed to other parts of the system. The future will therefore bring not just new products, but new configurations of intelligence, he noted.

While Aweida predicted that disk drives will undoubtedly have 3G bytes on a spindle within the next three to five years, he questioned how this increased capacity would be used if users don't have the tools to move the data around and safeguard files.

This will be done at the peripherals level in the future, he forecast, pointing to the fact that the amount of data requiring handling is growing far faster than the 33% annual increase in computer power.

To accommodate this growth in data, manufacturers must make it easier for users to automate files and create data bases. Adding functions to the disk systems so users don't have to track data will contribute to the ease of use, Aweida suggested.

By investing a bit more money in their disk systems, users can upgrade the intelligence of nearly every piece of disk equipment, he claimed.

Disk Costs Dropping

While processor prices are falling, Aweida does not see a vast reduction in the prices of disk subsystems because they are electromechanical rather than electronic in nature. Pointing up this difference, he said that in the near future processors could be built for 10% of their current price.

However, the price of disk storage is dropping. In the mid-1960s, it cost about $25 per 1M byte per month; with the IBM 3350 systems in use today, that cost is about $1 per 1M byte per month.

And when Whitney technology is widespread, that price will drop to 40 cents per 1M byte per month, Aweida said.

Users are turning more and more to tape to back up online information, rather than using tape for sequential processing. Tape costs about $10 per 200M bytes; nothing in the near future will beat that cost, Aweida said.

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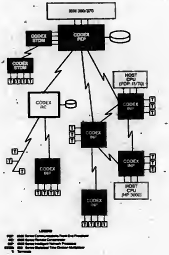

Honeywell Training Deaf For Computer Operator Jobs

WALTHAM, Mass. – Deaf adults in the Boston area now have the opportunity to become computer operators by participating in a course developed by two Honeywell, Inc. computer experts and a specialist from the Speech and Hearing Foundation of Massachusetts.

Sponsored by Honeywell, the course offers deaf students the chance to advance beyond entry-level positions by providing them with additional training – something which has been difficult for the deaf to obtain, according to a spokesman.

The course is set up so one Honeywell employee explains the fundamentals of DP and the basics of computer operations while an employee from the Speech and Hearing Foundation using sign language, interprets to the students. A Huneywell computer operator who is deaf also explains the specifics of computer operations.

One of the 10 students who took the first course was already employed by Honeywell as a keypunch operator, but wanted to upgrade her skills. Most of the students were also employed in the DP industry; several were promoted after completing the course, according to Kimball Nash, a Honeywell employee who is deaf. Honeywell said it may hire one or two of the students from that class.

Although handicapped people have proven themselves to be excellent employees, a Honeywell spokesman said, they do face extra problems on the job. Some of those problems include the inability to communicate by telephone and with fellow employees, who often have no understanding of the problems that deaf people face.

To counteract this last problem, Honeywell is offering a sign language course to its employees so hearing people can communicate with their fellow deaf employees.

Team teaching is one of the methods used by Honeywell to train deaf people to become computer operators.

Foundation Gets Funding

(Continued from Page 61)

a stumbling block.

"Initially, when we first got started, we found a lot of companies were pretty stringent about their requirements . . . but we've done the best we could to educate industry that some disabled aren't really trained and don't have the experience that industry really wants. So we're finding some companies are a little bit more open to considering some of our people even though they may not have the . . . experience that a particular job may call for."

To augment its educational efforts, the foundation has established an Executive Committee on Training in Boston to help develop training programs for the types of skilled workers sought by the electronics industry.

The foundation works as a link between the industry and rehabilitation organizations across the country. The project's officials hope to have some 200 companies or divisions and 400 rehabilitation resources participating in the program by the end of next year.

"We're working through executives of this association and contacting the [chief executive officers] of the major companies, whom we acquaint with the program," Sheehey said. In addition, "we have a lot of companies coming to us."

The foundation finds handicapped workers "from the community rehabilitation resources we link up with – workshops, state agencies for the handicapped, technical schools, universities, the Veterans Administration – any agency that might come in contact with a disabled person," he said. "They in turn send us a resume on one of their clients and we try to match them with job openings we get from industry."

The foundation has also helped those agencies direct their training programs to the needs of industry. The project compiles information every quarter on job openings and supplies it to rehabilitation organizations so they can see what the job market needs and structure their training services and job placement programs accordingly.

The Project With Industry program is one of several in which the foundation has been involved since it was established in 1975. More information on the project can be obtained from Dunlap at the Electronics Industry Foundation, Suite 201, 2001 Eye St. N.W., Washington, D.C. 20006.

Executive Corner

- Gary W. Nelson has been named vice-president of marketing for Smyth Business Systems, Inc.
- H. Richard Cossaboon Jr. has been appointed vice-president of corporate marketing for Tymnet, Inc.
- Roger Travis has been appointed vice-president of finance and administration at Epsilon Data Management, Inc.
- Roy Gemberling has been promoted to general manager of Digi-Log Systems, Inc.'s Network Control Division.
- Richard C. Frick has been named DP products manager at Leasametric, Inc.
- Donald R. Knapp has been appointed a vice-president in Index Systems, Inc.'s Banking Systems Group.
- Richard J. Walters has been named president of Martin Marietta Data Systems.
- Max P. Beere has joined Imperial Computer Services, Inc. (ICS) as vice-president of the ICS Consulting Group.
- D. Michael McGarr has been appointed executive vice-president of Autotrol Technology Corp.
- Douglas P. Chinnock has been named vice-president of research and development for Compuserve, Inc.

Correction

James R. Johnson has been appointed vice-president of Applications Development Systems. This firm is not connected to Informatics, Inc. [CW, Oct. 8].

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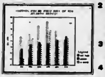

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CDC's Norris Envisions Net for Innovations

By **Jeffry Beeler**
CW West Coast Bureau

SANTA CLARA, Calif. — By easing the transfer of DP technology, computing systems can play a prominent role in encouraging the formation of small, entrepreneurial businesses, according to Control Data Corp. Chairman William C. Norris.

Speaking at the American Electronics Association's annual dinner meeting here recently, Norris outlined a commercial information storage and communications network that he said could "substantially increase" the flow of technical data to small firms.

In essence, the network would serve as an information clearinghouse where innovators could store descriptions of new, leading-edge technologies and list their potential applications for DP and other fields.

One of the network's two main data bases would catalog every significant technical discovery made by government or university researchers. For a fee, small firms would subscribe to the central data base and search its contents for possible solutions to their pressing research and development problems, Norris said.

In this way, the network could "greatly facilitate" the exchange of ideas between producers of technological information and its consumers, the CDC chief added.

The second of the network's two data bases would serve as a repository where small firms could describe any business problems for which they require technological solutions.

Tool for Small Firms

In describing the network, Norris appeared to be referring to a service similar to the one offered by CDC's recently announced Business and Technology Center (BTC) [CW, Oct. 15].

Norris sees BTC-like services as one means of increasing the small business sector's access to the advanced technology it needs to survive and remain healthy. Unlike big business, which accounts for a large portion of the U.S.' industrial research and development, small firms lack the financial wherewithal to develop all their own technology.

Much of their product know-how, therefore, must come from outside sources. Unless small business receives a steady transfusion of government and university research data, many start-up operations will find themselves hard-pressed to compete effectively with their much larger rivals.

The U.S. can ill afford to allow the environment that breeds new entrepreneurial operations to deteriorate further, Norris continued. Small firms account for almost all the country's new jobs and for about half its employment.

Itel Data Services Acquired for UCS

KANSAS CITY, Mo. — United Telecommunications, Inc. has agreed in principle to acquire the Utility Data Services Division of Itel Corp.'s Data Services Group for its wholly owned subsidiary, United Computing Systems, Inc. (UCS).

The Itel unit provides remote computing services from data centers in Dallas, Chicago and Metuchen, N.J., and offers services similar to those offered by UCS' Network Information Services Division.

UCS' international data communications network links customers in more than 200 U.S., Canadian and European cities with computer centers in Kansas City, Boston and London.

The terms of the proposed cash transaction were not announced.

6
Major
Topics
12
Industry
Experts
20
Years
of
Data
Processing

As Computerworld looks back at the 70's and ahead to the 80's in our Year End Wrap-Up Issue.

According to E. Drake Lundell, Jr., editor of **Computerworld**, this special decade-ending Wrap-Up Issue is "designed to be read thoroughly, not just glossed over and shelved." We'll do this by focusing on six major topics of current high interest to users, with selected industry experts covering each topic. One expert will look back a decade, and another will write on the future. Here are the details.

Technology — As the (by now) well known saying goes, "If the auto industry had done what the computer industry has done in the last 30 years, a Rolls-Royce would cost $2.50 and get 2,000,000 miles per gallon." We won't go back 30 years, but one of our experts will look back at the 70's, while another will look ahead to the 80's and what we can expect in the way of technological changes and their impact on data processing.

Minicomputers — Did you know that Computer Control Corporation was the world's leading minicomputer company back in 1970? Do you know what happened to them? The minicomputer has come a long way in the last ten years. One of our industry experts will look at how far it has come, while another will examine its future.

Medium to Large Systems — We've gone from tubes to transistors to large scale integration to very large scale integration. And the changes have been dramatic. Our experts will look at both the past decade and the coming decade to show you just how dramatic those changes have been.

Software — Nothing in the computer industry has been the butt of more jokes than "software" and all the images that word conjures up. But as we've all come to know, "software makes hardware happen" — and it will be increasingly important in the next decade . . .We'll also look at its development through the past ten years.

DP Operations — In 1970, "distributed data processing" was unheard of. Large central systems were the order of the day. We still have large centers of course, but we have a lot of other things as well. As DP has become a more integral part of the organizations it serves, DP Operations have become much more complex. Experts will look at both the past and the future.

Communications — It wasn't very long ago that the key to computer communications was the person who carried the punch cards from one office to another. So there's a lot of change to review — and a lot more to come in the 80's. Two experts will look at this aspect of data processing.

PLUS . . . We'll have short articles from industry leaders, both old-timers and young up-and-comers . . . and we'll take a humorous look at some of the predictions the experts were making back in the 70's and how they came out. (We'll also look at some predictions that were missed, like the microcomputer explosion.)

This could be the most important issue of **Computerworld** this year. If you want to find out what has been so you can better guess what will be; don't miss our December 31st issue. And if you market products or services in the computer field, you'll want your ad there. Closing date is December 14th. Your **Computerworld** representative can give you complete assistance in ad planning. Or, to reserve space for your ad, call Frank Collins at (617) 965-5800.

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Harris Expanding

MELBOURNE, Fla. — Harris Corp. has started a one-year, $25 million expansion program to increase the production capacity of its Semiconductor Group.

The first part of the project is a $17 million investment in three projects in the firm's existing semiconductor operations in Palm Bay, Fla. This phase of the expansion program includes a new manufacturing plant to produce complex photomasks for integrated circuits, a new warehouse and storage building and increased administrative facilities.

Later this year, Harris will expand its integrated circuit plant in Kuala Lumpur, Malaysia.

The Florida expansion will create about 250 jobs, many of them for engineers and skilled electronics technicians, Harris said.

Growing at about twice the rate of the semiconductor market — 24% vs. an 11% average for the industry — Harris is now one of the top 10 semiconductor producers in the country.

Predicted at $6.5 Billion

Semi Sales Seen Up 36% This Year

CUPERTINO, Calif. — The U.S. semiconductor industry this year will grow 36% from last year's level as shipments reach $6.5 billion.

That prediction is based on third-quarter shipments and preliminary shipment data for October, according to the Semiconductor Industry Association.

This year's predicted 36% growth would exceed the best previous annual growth rate of 31%, which occurred in 1975. Last year the industry recorded a 26% increase in growth over 1977.

Because of the expected recession, the association projected a modest 11% growth rate for 1980. Despite cautious predictions, however, backlog has continued to swell. Based on current shipment rates, the industry has a 28-week backlog.

Orders during the third quarter totaled $2.1 billion, and the industry has received 23% more orders than it shipped, according to the association's president, Thomas Hinkleman.

Hinkleman termed this overage "healthy and reasonable," commenting that anywhere between 15% to 25% more orders than shipments is considered healthy. However, unfilled orders in excess of 25% would not be sustainable, he added.

Rand Sells Four Cids

SAN FRANCISCO — Rand Information Systems, Inc. has signed four separate contracts totaling more than $5.6 million, the firm reported.

The contracts involve the design and development of advanced on-line order processing and distribution systems based on Rand's Comprehensive Industry Distribution System (Cids). Rand has already developed more than a dozen Cids-type systems.

Contracts

The contracts are with E.I. Du Pont de Nemours & Co., Abbott Laboratories, Conoco, Inc. and Mostek Corp.

Initial installation of the Du Pont system is scheduled for early 1981. The system will be implemented on an IBM 3033 computer using IBM's IMS data base management system.

At Abbott, the order processing system will support the company's domestic distribution of pharmaceutical and hospital products, Rand said. Scheduled to be installed at a pilot site next summer, the system will operate on an IBM 3032 host with a distributed network of IBM 4341s, using Cullinane Corp. IDMS data base management system and IBM's CICS data communication system.

Other Contracts

Olivetti Corp.'s On-Line System Division has been awarded a contract for the sale and maintenance of TC 800 teller terminals by the Hartford (Conn.) Federal Savings and Loan Association.

Raytheon Data Systems Co. has been awarded a contract for more than $1 million to provide a data communications network to Travel Industries Automated Systems, Pty., a consortium of three major Australian airlines. The network will allow travel agents to have on-line access to reservations information stored on multiple mainframes.

Pertec Computer Corp. has received a $607,000 contract from Cameo Data Systems, Inc. for Pertec's D3000, D3000-Extension and D1400 rigid disk drives for use with Cameo's controller.

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Prime Quarter Earnings Jump 136%

WELLESLEY HILLS, Mass. — Prime Computer, Inc. reported a 55% increase in revenues and a 136% increase in earnings for its third quarter compared with 1978's third quarter.

Earnings for the quarter totaled $5.4 million or 46 cents per share earned in the year-ago quarter.

Revenues topped $40.2 million, up from the $26 million reported in the third quarter of 1978.

Financial results for the third quarter include a non-recurring credit of $1.2 million or 10 cents per share resulting from a recent tax law change in the UK.

Prime has earned $11.8 million or $1.01 per share so far this year, up 99% from the prior year's nine-month earnings of $5.9 million or 52 cents per share. Revenues for the period totaled $104.7 million, a 56% hike from revenues of $67 million in the same period a year ago.

Pact for Software

In recent months, Prime signed its seventh joint marketing agreement to provide specialized applications software for its users. The most recent agreement is with Shipping Research Services, Inc. (SRS) of Houston, Texas, and Oslo, Norway, LSRS will provide shipbuilding design system software called Autokon for all general-purpose Prime minicomputer systems.

Under agreement, Prime sales representatives will introduce Autokon to appropriate prospects and will provide pre- and postsales technical assistance to SRS, its prospects and customers. SRS will be responsible for the direct sale and support of Autokon to Prime prospects and will introduce Prime systems to it sales prospects.

In addition, Prime has received a contract valued between $5 million and $10 million from Systronics Business Machines, Inc. The contract provides that Systronics will purchase 20 to 25 Prime 550, 650 and 750 systems during the next two years.

In another move, Prime recently opened a 193,000 sq-ft research, development and engineering in Framingham, Mass, marking the firm's 15th expansion here since it began operations in 1972.

The firm currently has 10 facilities in Massachusetts, where 1,400 of its 2,400 employees are located.

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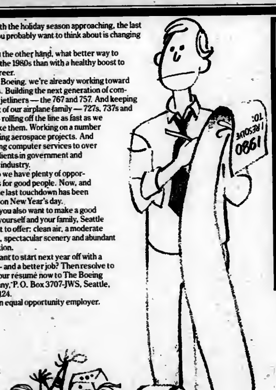

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BOEING
GETTING PEOPLE TOGETHER

Digi-Log Forms Micro Division

HORSHAM, Pa. — Digi-Log Systems Inc. has formed a Microcomputer Systems Division in order to keep pace with the distributed data processing environment.

The division will focus its sales efforts on distributors, systems houses, software houses and large end users. It plans to promote such product enhancements for Digi-Log's Microterm II as hard disks, application packages for word processing and data entry, expanded system configurations, such as multistation arrangements, and the integration of advanced technology, according to a Digi-Log spokesman.

Tha division was formed in line with a Digi-Log plan to segment product responsibility within the company so each division has its own marketing arm and separate controls and focus. The decentralized approach will increase Digi-Log's ability to specialize to meet the needs of its customers, the vendor said.

Digi-Log is planning to add five people to its corporate staff to accommodate the demands created by the new division.

IGC to Study Printers' Future

BOSTON — The 1980s will feature radical changes in the systems used to convert information from electronic to hard-copy form, according to the Institute for Graphic Communication, Inc. (IGC).

"Even greater changes are expected in the nature of the applications for this equipment," the institute said in announcing a research study to "identify business opportunities for electronically controlled hard-copy printers."

According to IGC, a new generation of such printers has begun with the IBM 3800, 6640 and 6670; the Wang Laboratories, Inc. Image printer; Xerox Corp.'s 9700; and Sanders Associates, Inc.'s Media 17/7 typographic printer.

IGC's study will explore users' needs "in specific product terms, including speed, image quality, reliability value, processing capability and paper handling."

Market projections for the major classes of printing systems will be based on an analysis of the user's needs and applications.

A prospectus detailing the study is available from Richard D. Murray at IGC, 375 Commonwealth Ave., Boston, Mass. 02115.

CCIA Reelects O'Kelley

SAN ANTONIO, Texas — Harold E. O'Kelley, president and chief executive officer of Datapoint Corp., has been elected to a second one-year term as chairman of the board of directors of the Computer & Communications Industry Association (CCIA).

Kelley was reelected by the members of the board of the Washington, D.C.-based association at its recent fall meeting. He has also served the group as vice-president and board member.

The CCIA is an international organization of nearly 70 DP and communications management firms with annual revenues in excess of $3.75 billion.

Export Markets Expanding for DP Equipment

By Richard Garnitz
Special to CW

The prospect for U.S. exports of computers and related equipment to both industrial nations and developing countries alike appears buoyant for the next several years. Recent Commerce Department market research estimated a sales growth as high as 20% annually in several countries.

This optimistic outlook reflects the expanding computerization worldwide in government, banking, manufacturing and retailing, as well as the strong U.S. technological lead. The American share of the installed computer base overseas is expected to grow from $29.3 billion in 1976 to as much as $45 billion to $55 billion in 1981.

The largest part of the latter figures represents Western European markets, which are projected at $30 billion to $38 billion. The Japanese market, however, is expected to reach $5.5 billion to $6.5 billion.

The trend toward increasing computerization abroad is similar to that in the U.S. in recent years:

In West Germany, for example, retail point-of-sales terminals are increasing at an annual rate of 15% to 20%, and even higher rates are anticipated once uniform product codes are put into effect.

In France, all major banks are introducing communications networks and thus increasing their purchases of financial terminals in the next two years.

In Mexico, the use of minicomputers accounts for two-thirds of the computer base and should become even more predominant for small and medium-sized companies, as well as for industrial process control.

West German Market

A recent Commerce Department study of 28 promising markets for U.S. computers and related equipment reveals a broad range of opportunities. Western Europe remains the major foreign market.

West Germany is the largest computer hardware market in Europe. The market totaled $1.8 billion in 1977 and is projected to rise an average of 18% annually, reaching $4.3 billion in 1982.

Distributed processing is one of the majur trends in the German market for both oew installations and additions to existing systems. It is especially suitable in Germany because large numbers of small business and "visible record" computers are already in operation, and these can function as terminals as well as independent units.

The market for microcomputers is still relatively small, but is expected to grow at an annual rate of 15% to 40% over the next few years.

The best sales potential in the German market is expected in mini and small computer systems, automatic banking and text processing systems, point-of-sale terminals, computerized microfilm installations for large collections of records in administration, insurance and related fields, optical scanning devices, magnetic ink recognition devices, high-speed printers, "intelligent" multifunctional and special-purpose terminals, microprocessors, data bank systems, "personal" computers and in parts and attachments for computer equipment.

French Market

The French market looks quite promising because modernization of information processing in the industrial, commercial and government sectors is increasing. The market appears especially strong for minicomputers in the data communications field, to supplement domestic production.

The overall French market is expected to increase about 20% yearly through 1980.

France is undercomputerized relative to its economy, compared with other Western European countries. Manufacturing will continue to be the sector with the greatest expansion in computer equipment and peripheral use, with total expenditures nearly doubling in the 1978-80 period.

Dramatic increases are also anticipated in the retailing, communications and medical services sectors.

In the next five years, there will be a movement — particularly by large organizations — away from centralized processing.

Great Britain and Others

U.S. exports of computers and related equipment to the UK are expected to increase by an average annual rate of 15% through 1980 as their prices become more attractive and their use grows more profitable.

Business and commercial applications, for which more than one-third of all minicomputer installations are used, are expected to increase in importance. The market for small business systems is forecast to grow significantly, not only among smaller firms but also among large users seeking to decentralize operations.

For other industrial nations, Italy, The Netherlands, Japan and Switzerland are expected to enjoy the same growth rates as Britain. Twenty percent annual expansion is anticipated for Spain, Australia, Denmark and Sweden.

Among emerging country markets, Mexico is the most promising, with a projected 20% growth rate annually this year and next. Sales prospects have been particularly bright since the Mexican government abolished a system of quotas for computers and lifted its requirement for import permits.

The Mexican market for peripherals is marked by a steady shift in demand toward more efficient and sophisticated equipment and by increasing use of input-output terminals.

The most active users of DP techniques are government agencies and government-supported organizations. U.S. equipment accounts for about 60% of the import market, totaling roughly $50 million in 1977.

The Korean market should experience increases of 20% this year and next in purchases of U.S. computers and related equipment as both government agencies and private businesses increase their use of DP operations.

The Algerian market forecast calls for an increase of 25% to 30% in purchases of U.S. equipment as the government begins to implemeot the "First Computer Plan," which calls for a sixfold increase in the computer population over the next several years.

Firms that lack experience in export can use Commerce Department's broad array of services, which can make a big difference in controlling marketing costs and avoiding some of the pitfalls of any new venture.

Marketing counseling and identification of sales prospects are provided at low cost.

More information about these services can be obtained by writing the Department of Congress, Room 4053, Washington, D.C. 20230.

Garnitz is director of the Department of Commerce's Office of Export Marketing Assistance.

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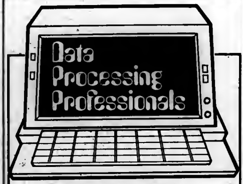

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BLOOMSBURG STATE COLLEGE. Computer and Information Science position open, Spring or Fall, 1980. Qualifications: Graduate degree (earned doctorate preferred) in computer or business field. Some experience in commercial/financial applications or other computer applications. Teaching experience desired. Certificate in Data Processing preferred. Rank and salary commensurate with qualifications. Contact: Dr. Frederick Bierly, School of Business, Bloomsburg State College, Bloomsburg, PA 17815. An Affirmative Action/Equal Opportunity Employer. Please respond by December 10, 1979.

PROJECT MANAGER/ DIME NETWORK ANALYST

Firm specializing in online computer retrieval of demographic data seeks individual to coordinate activities of a DIME project for the computerized delineation of geographic areas. Development of online computer editing and graphic display software and project supervision. Work experience with DIME network applications, familiarity with small area demographic analysis and computer programming in FORTRAN is required. Bachelor and Master degrees in Urban Planning, Geography or related field with emphasis on systems applications, good towards work experience requirements. Starting salary $13,520 — $16,940 depending on qualifications. Submit resume by December 15, 1979 to Urban Decision Systems, P.O. Box [illegible], Los Angeles, CA [illegible].

MANAGEMENT POSITION AVAILABLE

Expanding law publisher needs senior analyst-programmer to develop, implement and manage new editorial, production and business systems. Will oversee all systems projects and be responsible for hardware/software evaluation and selection, systems testing and conversion, technical specifications and some of the programming, systems management and cost/benefit evaluation. Must be adept at applying computer techniques to solve business problems. Send resume and salary requirements to:

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797 Washington St.
Newton, MA 02160

PROCESS CONTROL SPECIALISTS

· Software
· Hardware
· Chemical Process Engineers

Aramco needs you and your computer skills to harness the immense gas reserves of Saudi Arabia, specifically for NGL plant application.

Aramco is the world's largest oil-producing company and the key firm involved in the development of Saudi Arabia's energy resources.

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Saudi Arabia has asked us to harness the energy from the ten billion cubic feet of gas being flared every day. That calls for computer-based plant control systems. And that's why we need good people like you.

First to Phoenix, then Saudi Arabia

Multiple teams are being recruited to participate in the development of these NGL plant control systems. Initial work assignment will be in Phoenix where the systems are being developed. The team will share in the design, development and installation of their very own system. There will be travel opportunities here and abroad to supervise vendors who are producing the subsystems. In approximately 1981, the team will take its system to Saudi Arabia.

Software Specialists. You'll monitor software packages and systems development in a real-time process control environment. You'll be in on the design, development and installation of the whole system. Candidates should have a BA or BS in Physical Sciences, Engineering or Computer Science, plus at least 5 years' experience. We prefer that 2 of these be on real-time systems.

Hardware and Instrument Specialists. You'll monitor the development of all hardware and instrumentation used in this project. You'll be in on the design, development and installation of the whole system. Candidates should have a BA or BS in Engineering or Physical Sciences, plus at least 5 years' experience in real-time applications.

Chemical Process Engineers. You'll coordinate the computer-based plant applications and optimization for this plant project. You'll be in on the entire process control system from its development to installation. Candidates should have a BS or MS in Chemical Engineering, plus at least 5 years' experience in process control.

Excellent combination of benefits offered

As a Process Control Specialist with Aramco, you can earn a competitive salary, plus a cost-of-living differential. In addition, you get a tax-protected premium for overseas employment which can amount to as much as 40 percent of your base salary.

Beyond that, Aramco offers you a comprehensive benefits package which includes 40 days' paid vacation every 12½ months (this gives you the opportunity to travel in Europe, Asia, Africa)—plus housing for singles and families, and American school systems for your children.

Interested? Send your résumé in confidence to: Aramco Services Company, Department CW111279-DRB, 1100 Milam Building, Houston, Texas 77002.

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The Information Systems Department supports the patient-oriented computing requirements for the University of Iowa Hospitals & Clinics. The Department is currently developing a patient centered Hospital Information System. Application development and operation is carried out on an IBM 370/158AP under MVS utilizing PL/1 and IBM's Patient Care System. The system currently supports 200+ terminals in applications ranging from appointment scheduling to laboratory result reporting. We have the following management position openings:

ASSISTANT DIRECTOR — ADMINISTRATIVE AND FINANCIAL APPLICATIONS

To provide leadership and direction in the tactical planning, development, and maintenance of the application systems in the administrative and financial areas. A Bachelor's Degree in a Computer Science related area or an equivalent combination of education and experience is necessary. Progressively responsible technical, administrative and supervisory experience in data processing is required. The salary range is $19,430 to $30,790, depending on qualifications.

ASSISTANT DIRECTOR — TECHNICAL OPERATIONS

To provide leadership and direction to the computer operations, data base, and systems programming areas. Foremost responsibilities include tactical planning for an effective management decision process and coordination of the computer operations, data base and systems programming areas to insure an efficient operating department. Systems programming knowledge is required. A Bachelor's Degree in a Computer Science related area or an equivalent combination of education and experience is necessary. Progressively responsible technical, administrative, and supervisory experience in data processing is required. The salary range is $19,430 to $30,790, depending on qualifications.

Send resume, salary history, and position desired to

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Information Systems Department
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*Programmers COBOL, BAL, RPGII, etc	$16-20,000

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(305) 825-5453

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Our technical environment uses state-of-the-art integrated information systems with a 7-Megabyte IBM 370-168 AP supporting: MVS; VTAM with SNA; IMS DB/DC; CICS;TSO.

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Mr. A. M. Strickland
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P.O. Box 529100
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Minimum of 3 yrs. experience in CICS/VS, VSAM, VTAM; knowledge of RPGII helpful; growing Los Angeles Company converting from System 3 to 4341.

Please submit resume including salary history in confidence to:

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The U.S. Operations Manager position requires a thorough knowledge of the U.S education market segment and an understanding of the industrial training market segment. The individual will be responsible for a complete understanding of the business aspects of supporting a field sales organization within the product line structure.

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Responsibilities include market/product planning for administrative and instructional Data Processing in the Educational marketplace, development of the 5-year market plan, and the design and development of product/market plans which continue our growth and market penetration.

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Aramco needs you now to mastermind a vital EDP plan for our computer network.

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Some of our projects are the world's biggest. They are staggering in scope, complexity and imagination. Nowhere else is such advanced technology being applied so widely.

Our computer installation is at the heart of the vast network of Aramco activities. Here are the highlights of the installation. Two IBM 3033's, one 370/158, one 370/168. The operating systems are: MVS/SE, JES2, TSO, IMS/VS.

Aramco's regional teleprocessing network will be growing from 800 terminals to 1,500 next year and will include Multiple Systems Coupling to data centers in Europe and the U.S.A.

Our ever-expanding facilities call for a growing staff of good EDP people, people like you.

The immediate openings

- ***EDP Planners.*** There is a wide variety of activities available: Making evaluations on hardware and software, recommending products, making compatibility studies. Developing a long-range plan and coordinating it with other business plans. Doing capacity audits and studies, proposing capacity plans, advising on options. Evaluating software quality and performance against specifications. You may want an assignment that lets you do *several* of these activities.

Requirements: a BS degree (exceptions will be made for OS or MVS systems programmers); you should also have 3 years' experience with a major IBM system. If you've worked as a systems programmer, so much the better.

- ***EDP Trainers.*** You'll spearhead a vigorous training program for programmers and analysts, using live classroom instruction, on-line IIS courses, Deltak videotape courses. Training emphasis will be on JCL, TSO usage, also IMS/VS, MARK IV, PL/I.

Requirements: You should have exposure to IBM large systems environment, plus proven skills at teaching, administration of training programs, development of new courses.

- ***EDP Standards Writers.*** Your immediate responsibility will be to develop standards for a global corporate data-processing function. The standards you write will cover programming languages and practices, applications documentation, systems analysis techniques, JCL, TSO usage, local variations and much, much more.

Requirements: Broad exposure with the IBM large systems environment. You should be a strong technical writer and be expert in at least one relevant data-processing skill.

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Beyond that, Aramco offers you a comprehensive benefits package which includes 40 days' paid vacation every 12½ months (this gives you the opportunity to travel in Europe, Asia, Africa)—plus housing for singles and families, and American school systems for your children.

Interested? Send your résumé in confidence to: Aramco Services Company, Department CW112679JWCE, 1100 Milam Building, Houston, Texas 77002.

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Be part of a small turn key systems group that will be within writing customer software for series 1. Good growth — ground floor opportunity.

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- Large IBM hardware experience in COBOL, PL1, and OSJCL. Exposure to PANVALET CICS, and data base management concepts a plus.
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Candidates must have in-depth knowledge of materials supply systems, policies and procedures as they concern these areas: methods of inventory investment control—determination of requirements—receiving, storing, issuing, reclamation and disposal of obsolete materials. Plus utilization of surplus materials, physical inventory, control documentation, record keeping.

We seek 8 to 10 years' diversified experience in materials supply management, in economics and systems design or management. Military, government or big corporation experience is an asset. So is a knowledge of EDP. You must have a BS or BA degree in Economics, Business Administration or Engineering.

Excellent combination of benefits offered

As a Systems Designer with Aramco, you can earn a very competitive salary, plus a cost-of-living differential. In addition, you get a tax-protected premium of up to 40% on your base salary for overseas employment.

Beyond that, you enjoy 40 days' paid vacation every 12½ months—this gives you the opportunity to travel in Europe, Asia, Africa. Housing is comfortable. Children's schools are excellent.

Interested? Call Jon Calloway now. Toll-free: 1-800-231-7577, ext. 4066. In Texas, call collect: (713) 651-4066. Or send your résumé in confidence to: Aramco Services Company, Department CW112679JWCD, 1100 Milam Building, Houston, Texas 77002.

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Data Processing

EDP SECURITY SPECIALIST

Virginia Based Bank Holding Company seeks highly motivated individual to design and establish procedures and controls to insure integrity and security in the development of a new MIS system. Individual will report directly to the General Auditor and provide senior management with alternatives in maximizing data security.

Candidate must have excellent written and oral communications skills. A Computer Science Degree is preferred along with a thorough knowledge of the security aspects in: Communication Software/Hardware Operating Systems, Data Management Systems, and Computer performance.
Current environment includes IBM 3031 DOS/VS POWER.

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Excellent opportunity for a systems programming specialist. This is a senior level position in a progressive college environment.

- Programming expertise is required in at least two languages including IBM 360/370 assembler plus a high level language.
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EOE-M/F

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- System Interface Specification
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- Support Equipment

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The MITRE Corporation,
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PROGRAMMERS SUNNY FLORIDA

PROGRAMMER I — Should have 3 years experience with RPG II, on S/3, CCP desirable, degree preferred.

PROGRAMMER II — Should have minimum of 1 year's experience with RPG II, on S/3, CCP desirable, degree preferred.

All replies confidential. Relocation costs paid. Liberal company benefits. For immediate consideration send resume to:

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MVS SYSTEMS PROGRAMMER

You will be responsible for the generation, maintenance and enhancement of a modified MVS operating system. Major supported subsystems are JES2, TCAM, QCM and ACF2. BS degree plus at least two years systems programming experience on MVS and SMP is required.

SYSTEMS PROGRAMMER

You will be responsible for installation, maintenance and support of compilers, a data base system and SMF application packages. Specific products to be supported are PL/1, FORTRAN, SPEAKEASY, BASIC AND IDMS. A BS degree plus at least two years experience with PL/1, BAL and AMP is required.

APL PROGRAMMER

You will be responsible for the support of our large APL user community. Applications are primarily scientific although financial and project planning packages are available. In addition to user assistance you will be responsible for the VSAPL software and public workspaces. BS degree plus exposure to scientific applications programming and APL is required.

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To investigate these opportunities further, we invite you to forward a resume or detailed letter including salary information to Ken Keeler, Dept. 11CW, GTE Laboratories, Inc., 40 Sylvan Road, Waltham, MA 02154

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Typical duties include:
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- General supervision of projects, assisting the Director of Computer Services and leadership of a staff of six programmer analysts.

The applicant should possess:
- Strong assembler language experience and an in-depth knowledge of computer and information systems concepts.
- Broad knowledge of DOS/VS, teleprocessing, and COBOL applications.
- Ability to communicate with non-EDP personnel, plan and execute project schedules and deal effectively with people.
- Must be able to readily assimilate new administrative processes and procedures.

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EOE-M/F

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Computer Programmers

UNITED AIRLINES

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Requires 2-5 years' COBOL experience, recent experience with hardware/software of the Univac 1100 series and ability to work well in a team environment. On-line experience preferred but not required.

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UNITED AIRLINES

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James A. Ward & Associates has been retained by a large and diversified financial corporation to recruit several EDP professionals for a new Florida data center. Our client is centralizing its nationwide Data Processing operations in the Sunshine State, creating ground floor opportunities from the Junior Programmer to Senior Analyst/Project Leader levels. Rapid growth and advancement are assured in this progressive, state-of-the-art environment.

Minimum requirements include two years of COBOL or Assembler programming experience. CICS or IBM highly desirable. Environment is large IBM OS/MVS. DOS or other large mainframe experience will be considered. Any Data Base experience is a big plus. For senior positions, knowledge of Accounting or Financial applications is needed (banking or insurance background will suffice). A college degree is helpful but not required.

Salaries from $20,000 to $32,000 depending on ability and experience. THESE OPENINGS ARE CRITICAL AND IMMEDIATE.

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S. Calif. Carpet Mill seeking prog/anal with COMP/SCI degree or 2 years PGM exp. Must have strong formal database skills, knowledge of on-line TP techniques. Salary open. DEC basic-plus exp. Helpful. **Contact Jon Spencer at Tuftex Carpet Mills, 16000 Heron St., La Mirada, CA 90638 (714) 521-6652.**

NMSU Computer Center is seeking three (3) Programmer II positions for Administrative Applications. Six to twelve months COBOL application desired. Knowledge of IBM OS JCL and on-line experience helpful. Bachelor Degree desirable. Salary to $12,500. Application Deadline: December 13, 1979. Send resume to Ron Wills, NMSU Computer Center, ASB, Box 3AT, Las Cruces, New Mexico 88003. Starting Date: December 20, 1979. NMSU IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

PROCESS CONTROL ANALYSTS AND ENGINEERS

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How you'll be helping

Process Control Hardware Engineers. You'll be working with remote data acquisition hardware and Automated Master Station equipment in a real-time environment. You should have a BSEE degree and st least 3 years' experience in process control hardware maintenance and engineering, preferably in power systems.

Systems Analysts. You'll work with SCADA and EMS systems in a real-time environment, utilizing a multiple computer Master Station. You'll do software maintenance and anslysis. You should have a BS in Electrical Engineering, Math, or Computer Science, plus at least 3 years' experience in process control systems, particularly in the areas of Man-Machine interface and Operating System software, also a knowledge of Fortran and Assembly programming languages.

Power Systems Analysts. You'll monitor power systems application programs—you'll do studies on power control and security analysis. You should have a BS in Electrical Engineering or Math, plus at least 3 years' experience in power systems control and a knowledge of application programs such as load flow.

Power System Engineers. You'll utilize load flows and security analysis applications. You'll participate in entire development and installation of this new EMS system. You should have a BSEE or MSEE, plus 3 to 5 years' experience in power control systems—also a background in applications programs such as load flow or security analysis.

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Programmers

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COMPUTER SPECIALISTS

SCIENTIFIC PROGRAMMER/ANALYST with 3-5 years scientific programming experience with BS in Math or Engineering to supply in engineering modeling efforts in the energy field. IBM experience and knowledge of FORTRAN necessary.

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PROGRAMMER/ANALYST to provide programming for business, scientific or engineering applications. Responsibilities including coding, debugging, and documentation of general type programs. BS in Math or Computer Science/Math or equivalent experience is required. Knowledge of FORTRAN and COBOL essential.

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Our client, a major financial institution based in San Francisco, has engaged us to find a number of EDP Operations Professionals. All of the positions offer excellent compensation.

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FLORIDA

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ANALYST: DDA & savings applications 370 OS/MVS	20K
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The Computer Science Department invites applications for several tenure track Assistant/Associate Professorships to be filled starting September 1980 or earlier. The University of Alabama in Huntsville, located in the sunbelt, is a comprehensive state university with nearly 5,000 students. It has its own outstanding computational facilities including a Univac 1100/10 with additional research possibilities for faculty utilizing the large computer systems operated by the U.S. Army, NASA, and national/international computer related businesses and industries located in Huntsville. Additionally, the department has its own microcomputing laboratory. The department currently has five faculty members, and is responsible for a growing program which currently grants a Masters Degree. The university considers Computer Science a very important growth area, and is presently reviewing proposals for both a Bachelors and Doctoral program. Doctoral programs currently exist for Physics and Engineering.

The department seeks candidates in the broad areas of:

- Systems and software including, but not limited to, compilers and operating systems, computer networks, data base management systems, programming languages, or software engineering.
- Algorithmic processes including, but not limited to, computational complexity, combinatorics, or artificial intelligence.

Candidates should have a Ph.D. Degree in Computer Science or equivalent and will be expected to contribute to an ongoing program of research and teaching at both the undergraduate and graduate levels. Rank and salary are dependent upon qualifications. Applications will be accepted as long as the positions remain open.

Resumes and three references should be submitted to

Dr. James D. Johannes, Chairman
Computer Science Department
The University of Alabama in Huntsville
P.O. Box 1247
Huntsville, Alabama 35807

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2) Software Systems Specialists

. . .to provide software systems support in MVS, JES2 maintenance and performance tuning; VBS2 release 1.7 maintenance; MVS teleprocessing; IMS/VS maintenance; or data storage management using two 3033's, three 3031's, and two 370-168's. Must have a minimum of 5 years experience in systems, installing PTF's, problem diagnosis, and assembly language coding.

3) Computing Performance Management Specialists

. . .to assist in establishing a computing performance management function of a facility with two IBM 3033's, two 370-168's, and two remote 3031's; establish/track computing user's service levels and systems performance levels; conduct performance evaluation studies to identify system bottlenecks; determine computing capacity; develop optimum workload balancing and proper system configurations; and use advanced software and hardware monitoring tools to assist in the performance measurement activities. Experience should include 5 years general data processing, and 2-5 years evaluating computer hardware/software performance, plus background in operating systems, statistics, modeling, and a BA/BS degree or equivalent.

Computer-Aided Manufacturing Programmers

In the CAM areas, Lockheed is designing online manufacturing systems that will encompass several applications ranging from Bills of Material to generative process planning to distributive shop floor data systems. If you have a solid background in CICS, DL/I and data base design, look at these openings.

4) Management Information Specialists

. . .to provide technical guidance in the conception, design, and implementation of manufacturing, computing systems. Immediate assignment will be in the planning, development, and implementation of an online system in CICS, DL/I environment. Must have 10 years experience in data processing with 5 years of project technical management. Secret clearance required.

5) Management Systems Specialists

. . .to develop an online CICS, DL/I environment supporting manufacturing, finance, and product support. Must have 5 years experience in business data processing with a minimum of 2 years experience in CICS command, level programming, and DL/I. COBOL and BAL programming language essential. Secret clearance required.

6) Data Processing Coordinators

. . .to support an in-house generative planning/manufacturing system which involves interfacing with manufacturing personnel to define system requirements for generation of manufacturing operations sheets, routing program developments, and maintenance. Must have 5 years experience in FORTRAN and COBOL in a manufacturing environment. Experience in TSO, data base design and online applications desirable. Secret clearance required.

7) Data Processing Programmers

. . .to perform manufacturing and business program development and maintenance. Must have 2 years experience in business programming utilizing COBOL and PL/I. Experience in CICS and DL/I also desirable. Secret clearance required.

Computer-Aided Design Programmers

Lockheed is providing a variety of CAD tools for its engineering staff, ranging from graphic systems such as CADAM to finite element programs for structures and aerodynamics. We need applications programmers with solid background in structural analysis disciplines that will provide guidance to the engineering technical staff in problem formulation and solution as well as develop new application programs. Look at these openings.

8) Scientific Computer Applications Specialists

. . .to provide engineering programming support primarily in the structural analysis disciplines. Primary assignment is in the support of the COSMIC NASTRAN system on IBM mainframes. NASTRAN support will include consultation services for users, DMAP programming, system enhancements, and maintenance. Must have 5 years experince in structural analysis disciplines like stress, loads, or dynamics with 1-2 years engineering programming experience on IBM mainframes. Must have a BS degree in Engineering or Physics. Secret clearance required.

9) Scientific Computer Applications

. . .to provide general engineering programming support including development of specific application programs in conjunction with members of the engineering technical staff, and modification and maintenance of existing applications programs. Must have 3-5 years programming experience and a BS degree in Engineering, Physics, Math or Computer Science. Secret clearance required.

10) Computer Systems Specialists

. . .to provide system programming support for an IBM MVS shop including the support of CICS/VS, VSPC, and shop floor data systems. Must have 5 years of system programming experience with 2 years CICS/VS and DL/I experience, and a BS in Computer Science. Secret clearance required.

If your talents fit one of these job opportunities Lockheed has to offer, send your resume now to Greg Dixon, Lockheed Employment Office, P.O. Box 551, Burbank, CA 91520. An equal opportunity F/M employer.

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PROGRAMMERS

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• DMSP	Telemetry/Command Systems for the Defense Meteorological Satellite Program TELOS Facility - Santa Monica, CA.
• DSM	Data Systems Modernization for the Satellite Control Facility TELOS Facility - Sunnyvale, CA.
• SYSTEMS SOFTWARE	Language Processors, Data Base Systems TELOS Facility - Santa Monica & Sunnyvale, CA.

TELOS' current and ongoing requirements on these and other projects encompass all aspects of system life-cycle support including analysis, design, implementation, installation and training.

TELOS is a career oriented company offering excellent salaries, attractive fringe benefits, and opportunities for growth and advancement. Our steady growth of the past ten years attests to the high quality performance of our employees. If you are in the top 10% of the realtime/systems programming community, please rush your resume to:

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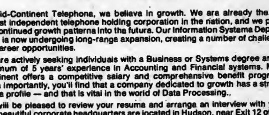

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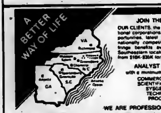

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For further information please write Personnel Services Office, BALL STATE UNIVERSITY, Muncie, IN 47306. Application deadline December 7, 1979.

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We are working with several of the largest banks in the West and Southwest. They have urgent needs for professionals in ATM, Trust, DDA, EFT and other financial applications.

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PROGRAMMER ANALYSTS

Excellent opportunities presently exist for programmer analysts with a Bachelor's Degree in any scientific discipline or equivalent experience, with Union Carbide in these corporate departments:

TIME SHARING SERVICES DEPARTMENT

Activities for this position will include telephone consultation, user site visits and seminars, and special assignments involving the design, implementation and exercise of programs and procedures. You will also support the usage and operation of on-line, large scale computer systems. To qualify, you must have 3-5 years' experience using inter-active versions of compilers such as FORTRAN and BASIC; and/or a proven knowledge of PL/1 and Assemblers, Operating Systems, and Data Base internals.

SCIENTIFIC APPLICATIONS DEPARTMENT

Your responsibilities will include development of computer systems for Union Carbide users. You will be specifically concerned with development of software and application programs for mini computers and micro computers. A knowledge of some programming languages preferably FORTRAN and ASSEMBLERS is required. Some experience with mini/micro computers as applied to process applications and knowledge of operating systems such as Data General's RDOS and AOS would be desirable.
For confidential consideration, please send your resume to: Salaried Personnel Department

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UNION CARBIDE CORPORATION
Linde Division
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An innovative training institute for foreign students has an immediate requirement for a Director of Technical instruction. We are seeking an individual with significant career progress in technical instruction and curriculum preparation, proven professional capabilities in data processing, preferably with IBM teleprocessing systems. An advanced degree in education or data processing related field preferred. Position responsibility includes supervision of a Technical instructor Staff engaged in preparing and teaching an intensive two year data processing curriculum.

We offer a unique growth opportunity, starting salary commensurate with experience and a superior benefits program. For immediate consideration, send resume, including salary history to Harry T. Delk, Director of Personnel & Administration.

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- Master's Degree in related field

Salary competitive, outstanding benefits. Send resume, references and salary history by December 15, 1979 to:

Dr. Robert S. Sullivant
Executive Vice President
The University of Toledo
Toledo, Ohio 43606

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RICHARDS

DATA PROCESSING PROFESSIONALS

We are looking for qualified professional Data Processors to add to our existing staff. We are heavily involved in the development of a new MIS function within a rapidly growing business environment. This business environment requires the development of MIS applications that will be technically challenging, utilizing the latest concepts of IMS/CICS, distributed Data Processing, computer networks, IBM OS/VS 1, RJE, with COBOL as the primary language.

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Project Manager-Distribution and Marketing Systems - Responsible for the management of a team of Data Processing professionals whose mission is to provide extensive Data Processing consulting services and to design, develop, install, and maintain large-scale Data Processing networked systems for the distribution and marketing business areas. User support will be required on a local and remote basis–both domestic and international operations will be included.

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The position duties include: preparing system design; programming specifications; coding programs; developing test data and JCL; testing and debugging programs; conducting systems tests and parallel; user communication interface training; and assisting in training operations in the proper operation and installation of the system.

Qualified applicants should possess 2-5 years' experience including OS/VS JCL/Utilities and extensive COBOL backgrounds.

All positions require an extensive technical background and experience in all aspects of software development, installation, and support. Communications skills are key and a definite requirement.

For immediate consideration, call or send a complete resume to: Moran Sharp, c/o Richards Manufacturing Company, 1480 Brooks Road, Memphis, TN 38116 (901-396-2121).

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A progressive and outstanding southwest utilities company, located along the Gulf Coast in Beaumont, Texas, is actively seeking a Systems Analyst.

The position requires a Bachelor of Science degree in Computer Science and 0 to 3 years of experience with a large main frame computer system. The candidate should be proficient in the use of FORTRAN, COBOL, and MARC IV programming languages. Knowledge of ALC is helpful.

Gulf States Utilities offers comprehensive benefits, competitive salaries, and relocation expenses. Send your resume and salary requirements to:

Christopher B. Fite
Supervisor of Employment

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SYSTEMS ANALYST

Leading financial institution located in Chicago Loop has two challenging opportunities available in its rapidly developing computer information systems department.

The senior position requires a Bachelor's degree in Computer Science or Math and five to seven years experience in major system design and development in either financial or insurance applications. Background must include teleprocessing experience in an IBM 360/370 or compatible environment. Knowledge of DOS and/or OS environments under CICS and COBOL and Assembler languages a must.

The analyst position qualifications include a degree or equivalent in Computer Science or Math and two to three years application programming/analysis experience in the financial or insurance industry. Background must include some analysis and design of on-line applications in an IBM 360/370 DOS or OS environment. COBOL experience necessary and assembler a plus.
Salary is open, with a full range of benefits, including educational support and profit sharing.

Send detailed resume and salary history in confidence to:

Personnel Director
Kemper Financial Services, Inc.
120 S. LaSalle St.
Chicago, IL 60603

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ASSISTANT DIRECTOR FOR UNIVERSITY SUPPORT SYSTEMS

Rapidly growing State of Illinois universities' computer center, located in west-suburban Chicago, is seeking an Assistant Director for University Support Systems. Under general guidance of the Executive Director, responsibilities include high level systems consulting, maintenance and development of university support systems and leadership of assigned programming and systems staff.

Qualifications include a Bachelors Degree in business or information systems, three years of experience in medium to large scale data processing installation in systems and programming, experience in dealing with users and in developing systems specifications for computing systems. Experience in university systems or programming highly desirable. Salary commensurate with experience; benefits are attractive, including liberal vacation allowance and tuition reimbursement. Applications must be received by December 28, 1979. Send resume, salary history and names of 3 professional references to:

Barry R. Hemphill
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Illinois Board of Governors
Cooperative Computer Center
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Dartmouth College computing has a new position of telecommunications manager. We have a megabaud on campus network, a large time sharing system, and a private network serving 20 colleges and universities. We need someone with knowledge of hardware and software for a challenging job in a relaxed atmosphere.

Write or call William Y. Arms, (603) 646-2643, Kiewit Computation Center, Dartmouth College, Hanover, NH 03755.

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SALARY RANGE:
$1,712.00 — $2,081.00

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FRINGE BENEFIT ALLOTMENT:
$1,587.46 Annual

CONTACT:
Alameda County Office of Education
Room 136
224 West Winton Avenue
Hayward, California 94544

ATTN: Maebell Moffitt

TELEPHONE:
(415) 881-6205

APPLY:
As soon as possible — Open until Filled

QUALIFICATIONS:
Any combination equivalent to completion of two years of college supplemented by formal training in electronic data processing and 4 years of experience in systems and programming work, including software for operating systems, compilers, virtual machines or systems, access methods for secondary storage devices, telecommunications software and equipment, and data base management. (COBOL and FORTRAN).

DATA COMMUNICATIONS ANALYST

Experience in designing and implementing on-line networks and application programs using Burroughs protocols. Fluent in COBOL and able to document past application programs. Send resume to:

Personnel Manager
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Our commitment to Telecommunications includes word processing systems, office information systems, and integrated information systems. And we're involved in all telecommunications product lines, from the standards; 2780, 3780, 3270, HASP, x.25, and SDLC/SNA, to MAILWAY Wang's Electronic Mail Message System.

Our long range projects are aimed at developing telecommunications as the foundation for future automated systems. This commitment has created the need for qualified writers to research, organize and write telecommunications related documents. These include operator's manual, network/operations/communications managers' manuals, technical staff programmers' guide and data sheets.

To qualify for this position you must have two or more years of technical writing experience and a Bachelor's Degree.

We offer excellent salary and benefits including profit sharing, stock purchase plan, stock bonus plan, medical and dental insurance. Please send resume, including salary history to **John Payne, Professional Recruiting, Wang Laboratories, Inc. 836 North Street, Tewksbury, MA 01876.**

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- Substantial experience with medium-scale IBM systems under DOS/VS using BAL, PL/I, and telecommunications.
- Specific experience in soft goods retailing.
- Specific experience with accounting and financial systems.
- Ability to work closely with senior management and consultants.

The ideal candidate will have the above credentials and will have progressed through the ranks over a period of 8-12 years to the position of Director or Assistant Director in a medium-scale IBM shop.

Please send resume with complete salary history to:

CW Box 2131
797 Washington St.
Newton, MA 02160

Software System Performance Analyst

NCR's newly created Systems Engineering operation at Scripps Ranch, San Diego is shaping an entire new generation of interactive, transaction-oriented distributed processing systems for the 80's.

We have an immediate opening for a Performance Analyst who has familiarity with operating system development, and at least 3 years experience in performance measurement. Responsibilities include: measuring and analyzing a major software system, designing performance monitor and synthetic benchmarks, determining system capacity and throughput throughout development, and specifying performance instrumentation.

Arrange a full briefing by sending confidential resume and salary history to Mr. Doug Sjoberg, Manager Personnel Resources, Dept. R56, NCR Corporation, Systems Engineering, 16550 W. Bernardo Drive, San Diego, CA 92127. Or call Mr. Sjoberg collect at (714) 485-3356.

NCR
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DATA PROCESSING (PROGRAMMING) ADVISERS FOR OVERSEAS POSITIONS WITH THE U.S. BUREAU OF THE CENSUS DEPARTMENT OF COMMERCE

The Bureau of the Census is seeking well qualified data processing personnel with programming experience to be members of a team of technical advisors working with various users of the National Computer Center, Central Department of Statistics, Ministry of Finance and National Economy, Riyadh, Saudi Arabia.

The National Computer Center houses an IBM 370/158 (4 meg) with teleprocessing and data base management. Agencies using the National Computer Center facilities require technical help on initiating and managing a variety of automated systems, including economic, demographic, and management applications. Some systems are online.

Applicants for these 24-month assignments should have a thorough background in data processing and be capable of working with technicians from other countries. Experience in the following areas are important: COBOL and assembly language programming, OS/VS, MVS, CICS, TSO, VSAM, and IBM 360/370 computers.

Base salary ranges from $20K to $30K, depending on qualifications and experience, supplemented with a 20 percent differential and other allowances. Furnished housing and local transportation provided. Family to accompany. This is a Federal Government position, but is not in the career civil service.

Send resume or U.S. Civil Service Commission Standard Form 171 to:

U.S. Bureau of the Census
Personnel Division, Room 3245-3
Washington, DC 20233
Attention: Phyllis Green

Or call: Carl Gray (301) 763-2838 for further information.
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U F O IS TAKING OFF

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SOFTWARE DEVELOPMENT SPECIALIST — You will join a team designing and implementing state-of-the-art on-line products, working in an up-to-the-minute environment using IBM 4300 hardware. To qualify, you must have 3-5 years experience in development of on-line systems using CICS and an in-depth knowledge of BAL. Background in IBM DOS/VS or OS/VS internals, VSAM, DL/I and DB/DC is a definite plus. Salary range is $25 - 35K, plus liberal bonuses. Bonuses will depend entirely upon your ability to handle a workload effectively.

Please call or send your resume to Mark Florence, Manager of Development.

OXFORD SOFTWARE CORPORATION

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You must have a minimum of 2 years experience, including IMS and COBOL, in an IBM environment, preferably in manufacturing areas. Responsibilities will be varied.

PROGRAMMERS

Prefer a minimum of 2 years experience including IMS with IBM equipment plus a knowledge of COBOL in a manufacturing environment.

We offer qualified candidates excellent starting salaries and comprehensive company-paid benefits including paid relocation to Iowa. For consideration, direct your inquiry with salary history to.

JOHN DEERE

Ronald H. Like
Dept. PE-75
Deere & Company
Moline, Illinois 61265

An Equal Opportunity Employer M/F

PROGRAMMER/ANALYST

Applications are invited for the position of programmer/analyst at the computer center of Reed College. Responsibilities include system design, program design and flow charting, program implementation and documentation and operating system maintenance. Work will be on a mid-sized computer being acquired by the college for administrative use and on a PDP11/70 for academic use. Minimum requirements for consideration for the position are: BS in computer science (or the equivalent) and 3 years experience in computer programming and system design. Send resume and list of current references to:

Theodore W. Hartzog
Director Computer Center
Reed College
3203 Southeast Woodstock
Portland OR 97202

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Travenol Laboratories, a leading international manufacturer of medical care products, has maintained a compound annual growth rate exceeding 20% for 24 consecutive years. A key position is available in our Corporate EDP Audit Staff which offers excellent potential for career advancement.

Responsibilities will include auditing domestic and international data processing operations to evaluate controls, efficiency and security plus reviewing existing systems and developing new systems to ensure adequate controls and systems performance that meets user requirements. Qualified candidates should have 2-3 years experience in auditing and data processing, knowledge of financial and manufacturing systems, computer operations, IMS, COBOL, audit retrieval and systems design techniques. Excellent written and verbal communications skills are also important.

Travenol offers a sophisticated professional environment providing excellent growth opportunities, attractive salary and full benefits including stock purchase plan. For consideration, send a resume including salary history, in confidence to John Coit, One Baxter Parkway, Deerfield, Ill. 60015.

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data processing

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SOFTWARE INSTRUCTORS

We currently have openings at our Sunnyvale, California headquarters for qualified professionals ready to take that next step. We invite you to send your resume in confidence to Pat Ramirez, Professional Employment, Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, CA 94086. If you're not quite ready or need more information, please call 408/746-6166. We'll be happy to talk with you. We are an equal opportunity employer m/f/h.

amdahl

SPERRY UNIVAC

Sunbelt Opportunities for SYSTEMS ANALYSTS

Sperry Univac's Southern Operations is actively searching for experienced Systems Analysts for various locations throughout the Sunbelt. The challenges afforded by our diversified systems and client needs, offer Systems Analysts the opportunity to expand and shape their own careers.

These positions require a broad systems analysis background including experience with Exec 8, TIP, DMS, CMS, Systems Generation and Dump Analysis. Previous UNIVAC 1100 series experience would be a plus.

Sperry Univac offers the qualified candidate an excellent salary and fringe benefit program, as well as an outstanding internal and external training program. All interested candidates should forward their resumes, including salary history, in the strictest confidence to:

B.L. Freedman, Manager,
Field Personnel
Sperry Univac
6700 West Loop South
Bellaire, Texas 77401

SPERRY UNIVAC

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We understand how important it is to listen.

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DIRECTOR
COMPUTER CENTER

The regional computer center of a major progressive midwestern city, servicing multiple governmental agencies (municipal and county) seeks a thoroughly experienced technically competent DP professional for the position of Director of this large scale state-of-the-art computer installation scheduled for a 25% expansion in next 2 years.

The person selected for this position will have responsibility and commensurate authority for direction, management, planning and control of all computer center operations; internal structuring; planning and analyses; equipment evaluation for procurement; design development and implementation of all computer applications.

REQUIREMENTS: Education-college degree or equivalent. Master's degree in computer science or CDP desirable. Experience-significant DP including experience as a Director or #2 person plus record of accomplishment in DP positions subordinate thereto.

COMPENSATION: Substantial starting salary commensurate with ability and experience plus excellent comprehensive fringe benefits.

Please send resume including salary history in confidence to

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Director, University Computer Center — Plans and directs activities of the Computer Center at a major state university. The center serves as central computing facility supporting instruction, research and administrative activities through terminal, RJE and local batch access. Required four years' experience directing computing center utilizing large scale general purpose computing system, preferably in facility supporting all major aspects of university computing. Requires Master's degree in Computer Science or applicable field, management training desirable. Requires wide range knowledge of computing hardware, software, university academic and administrative functions, high-level management and technical skills, ability to effectively interface with administrators. Recognition such as CDP desirable. Salary is $32,000-34,000. **Submit application to Vice President, Office of Academic Affairs, Texas Tech University, P.O. Box [illegible], Lubbock, Texas [illegible], phone (806) 742-[illegible], prior to December 15, 1979.** An Affirmative Action/Equal Opportunity Employer

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Telecommunications Writers

Advance with Wang — a dynamic, high visibility company where challenges abound and projects are stimulating. Our telecommunications commitments encompass all product lines — computers, word processing systems, office information systems, and integrated information systems, and includes not only telecommunications standards such as 2780, 3780, 3270, HASP, x.25, and SDLC/SNA but also MAILWAY, Wang's electronic mail and message system. We recognize that telecommunications will provide the foundation for future automated systems and are committed to long range projects in this area.

Positions exist for qualified writers who are interested in researching, organizing and writing telecommunications related documents. Projects include operators manual, network/operations/communications managers' manuals technical staff programmers guide, and data sheets. Two or more years technical writing experience and a Bachelors Degree are required.

We offer excellent salary and benefits including profit sharing, stock purchase plan, stock bonus plan, medical and dental insurance. Please send resume, including salary history to John Payne, Professional Recruiter, Wang Laboratories, Inc., 836 North Street, Tewksbury, MA 01876.

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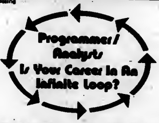

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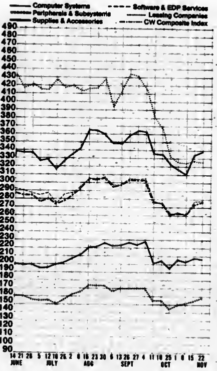

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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, NOVEMBER 20, 1979

All statistics compiled, computed and formatted by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

EXCH		PRICE 1978-79 RANGE (1)	CLOSE NOV 20 1979	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
A	AMDAHL CORP	17- 60	30 3/4	-1 1/4	-3.9
N	BURROUGHS CORP	59- 87	74 1/4	+1	+1.3
O	COMPUTER AUTOMATION	9- 44	9	+ 1/4	+2.8
N	CONTROL DATA CORP	24- 51	47 5/8	+1	+2.1
O	CRAY RESEARCH INC	8- 45	44	+5 1/4	+13.3
N	DATA GENERAL CORP	42- 74	49 3/4	- 5/8	-1.2
N	DATAPOINT CORP	34- 90	90	+1 1/2	+1.6
N	DIGITAL EQUIPMENT	39- 66	43 3/8	+ 3/8	+0.9
N	ELECTRONIC ASSOC.	2- 13	4 1/2	+ 1/8	+1.8
A	ELECTRONIC ENGINEER.	8- 19	13 1/4	+ 1/8	+0.9
N	FOUR-PHASE SYSTEMS	19- 44	40 1/2	+1	+2.5
N	FOXBORO	28- 44	38 3/8	+1 7/8	+5.1
A	GENERAL AUTOMATION	7- 28	13 3/8	-1 3/8	-9.1
O	GRI COMPUTER CORP	1- 3	1/2	- 1/8	-20.0
N	HEWLETT-PACKARD CO	24- 68	59	+3 1/4	+5.8
N	HONEYWELL INC	63- 83	73 7/8	+ 7/8	+1.2
N	IBM	62-328	61 3/8	- 7/8	-1.3
O	MANAGEMENT ASSIST	9- 29	19 3/8	+ 5/8	+3.2
O	MANUFACTURING DATA S	9- 33	30 1/4	+1 1/2	+5.2
O	MINI-COMPUTER SYST	2- 8	2 3/4	0	0.0
L	MODULAR COMPUTER SYS	7- 18	10 3/8	- 1/4	-2.3
N	NCR	57- 81	61 7/8	+5 3/8	+3.7
N	PRIME COMPUTER INC	9- 22	18 3/4	+ 1/2	+3.0
N	PERKIN-ELMER	17- 36	35 1/2	+1 1/4	+3.6
N	SPERRY RAND	33- 52	46 1/8	+1 3/8	+3.0
A	SYSTEMS ENG. LABS	11- 24	13	+ 3/8	+2.9
O	TANDEM COMPUTERS INC	13- 37	33 3/4	+1 3/4	+5.4
N	WANG LABS.	8- 29	29	+3 3/8	+13.1
	LEASING COMPANIES				
O	BOOTHE COURIER CORP	13- 21	17 1/2	+ 3/4	+4.4
O	COMDISCO INC	3- 21	10 1/4	- 3/4	-6.8
A	COMMERCE GROUP CORP	1- 1	3/8	0	0.0
A	COMPUTER INVESTORS GRP	1- 7	2 7/8	0	0.0
O	CONTINENTAL INFO SYS	3- 15	2 3/4	0	0.0
P	DATRONIC RENTAL	1- 4	2 1/2	0	0.0
A	DCL INC	3- 4	3 1/8	+ 1/4	+3.1
N	DPF INC	8- 14	7 7/8	+ 1/8	+1.6
N	ITEL	4- 36	3 5/8	- 3/8	-9.3
N	LEASCO CORP	24- 53	51 3/4	+5 1/2	+11.8
C	LEASPAC CORP	1- 4	1/8	0	0.0
A	PIONEER TEX CORP	2- 7	2 7/8	- 1/4	-8.0
N	U.S. LEASING	12- 20	13 3/8	- 1/4	-1.8
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	1- 2	1	0	0.0
O	ANACOMP INC	8- 24	16 3/4	- 1/2	-2.8
A	APPLIED DATA RES.	8- 17	9	0	0.0
N	AUTOMATIC DATA PROC	26- 40	38 1/2	+ 1/8	+0.3
O	COMPU-SERV NETWORK	3- 16	13 1/4	0	0.0
O	COMPUTER HORIZONS	1- 9	3 1/4	0	0.0
O	COMPUTER NETWORK	5- 16	5	+ 3/4	+3.2
N	COMPUTER SCIENCES	8- 17	15 1/2	0	0.0
O	COMPUTER TASK GROUP	1- 7	6 1/2	0	0.0
O	COMPUTER USAGE	2- 4	2	0	0.0
O	COMPUT AUTO REP SVC	4- 10	5 1/8	- 1/8	-2.3
O	COMSHARE	6- 26	17	+1	+6.2
O	CULLINANE CORP	14- 33	25 1/2	+2 1/2	+10.8
O	DATA DIMENSIONS INC	1- 4	1 1/2	+ 1/4	+20.0
O	DATATAB	1- 4	1	- 1/8	-11.1
N	ELECTRONIC DATA SYS.	18- 28	23 1/2	+ 1/2	+2.1
O	INSOTF CORP	1- 3	1 1/4	- 1/8	-9.0
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 6	5	- 1/4	-4.7
O	KEYDATA CORP	1- 4	3 1/2	0	0.0
A	LOGICON	10- 30	14 1/4	+ 1/8	+0.9
O	NATIONAL DATA CORP	7- 16	14 3/8	+ 1/4	+1.7
N	PLANNING RESEARCH	4- 10	5 3/8	0	0.0
C	PROGRAMMING & SYS	1- 1	7/8	- 1/8	-12.5
O	RAPIDATA INC	3- 7	4 1/4	0	0.0
O	REYNOLDS & REYNOLDS	10- 36	30 3/4	+2	+6.9
O	SCIENTIFIC COMPUTERS	3- 8	7 1/2	+ 1/8	+1.6
O	TYMSHARE INC	10- 46	44 1/2	+ 1/2	+1.1
A	URS SYSTEMS	5- 8	7 1/4	+ 1/4	+3.5
N	WYLY CORP	1- 2	4 5/8	+ 1/8	+2.7
	PERIPHERALS & SUBSYSTEMS				
N	ADDRESSOGRAPH-MULT	13- 32	23 7/8	- 1/8	-0.5
N	AMPEX CORP	10- 19	17 3/8	+ 1/4	+1.4
O	ANDERSON JACOBSON	3- 12	11 1/4	+1 5/8	+17.1
N	APPLIED DIG DATA SYS	6- 27	9 3/4	+ 7/8	[illegible]
O	BEEHIVE INT'L	3- 7	4 1/2	+ 3/4	+20.0
A	BOLT, BERANEK & NEW	6- 17	13 3/4	- 1/4	-1.7
N	BUNKER-RAMO	18- 29	24	-1 3/8	-5.4
O	CAMBRIDGE MEMORIES	2- 8	1 5/8	0	0.0
O	CENTRONICS DATA COMP	15- 54	47 1/2	+ 3/4	+1.6
O	COGNITRONICS	1- 4	1 7/8	+ 1/8	+7.1
O	COMPUTER COMMUN.	6- 10	3	+ 3/8	+14.2
O	COMPUTER CONSOLES	4- 16	15 1/4	+ 1/2	+3.3
A	COMPUTER EQUIPMENT	3- 8	4 5/8	+ 1/8	+2.7
O	COMPUTER TRANSCEIVER	1- 8	4	0	0.0
O	COMPUTERVISION CORP	5- 44	43 1/2	+ 1/2	+1.1
N	CONRAC CORP	13- 28	14	-1	-6.6
A	DATA ACCESS SYSTEMS	0- 10	8 3/8	+2 1/4	+36.7
A	DATA PRODUCTS CORP	13- 23	18 7/8	- 1/8	-0.7
O	DATUM INC	2- 6	2 1/8	0	0.0
O	DECISION DATA COMPUT	2- 8	2 7/8	- 1/4	-8.0
O	DELTA DATA SYSTEMS	1- 1	5/8	0	0.0
N	DOCUMATION INC	6- 34	16 3/4	- 3/8	-2.1
O	DATARAM CORP	6- 32	25	+2 1/2	+11.1
N	ELECTRONIC M & M	3- 9	3 3/4	- 1/4	-7.1
O	FABRI-TEK	1- 2	3/4	+ 1/4	+50.0
O	GENERAL COMPUTER SYS	1- 5	2	0	0.0
O	GENERAL DATACOMM IND	9- 21	15 1/2	0	0.0
N	HAZELTINE CORP	10- 19	18 3/8	- 1/8	-0.6
N	HARRIS CORP	17- 34	30 1/4	+1 7/8	+6.6
O	INFOREX INC	2- 11	7	0	0.0
O	INFORMATION INTL INC	7- 12	8 3/4	+ 1/2	+6.0
O	INFOTON	1- 3	2 3/8	0	0.0
O	INTEL CORP	28- 60	60	+2 3/4	+4.8
O	INTERSIL	7- 32	27 3/4	- 3/4	-2.6
A	LUNDY ELECTRONICS	4- 8	3 7/8	- 1/4	-6.0
O	MSI DATA CORP	4- 10	7 3/4	- 1/4	-3.1
N	MEMOREX	18- 50	19 7/8	-3 1/8	-13.5
N	MOHAWK DATA SCI	6- 15	12 7/8	+1 1/8	+9.5
O	CMEP	2- 8	8 1/2	0	0.0
O	PARADYNE CORP	9- 23	22	- 7/8	-3.8
A	PENRIL CORP	5- 12	10 7/8	- 3/8	-3.3
N	PERTEC CORP	8- 17	10 1/8	+ 1/8	+0.7
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RECOGNITION EQUIP	5- 13	6 3/4	+ 1/4	+3.8
O	SCAN DATA	1- 3	1 5/8	[illegible]	[illegible]
N	STORAGE TECHNOLOGY	14- 46	15	- 1/8	-0.8
O	T BAR INC	11- 25	21 3/4	+1 1/4	+6.0
A	TEC INC	6- 13	6	+ 1/4	+4.3
N	TEKTRONIX INC	35- 61	60	+1 3/4	+3.0
N	TELEX	3- 9	4 3/8	0	0.0
O	TESDATA SYSTEMS CO	6- 26	7 3/4	- 1/4	-3.1
O	WILTEK INC	1- 2	1/2	0	0.0
	SUPPLIES & ACCESSORIES				
A	AMERICAN BUS PRODS	6- 12	10 1/4	- 3/8	-3.5
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	BARRY WRIGHT	14- 34	15 3/8	+ 3/8	+3.2
O	CYBERMATICS INC	1- 1	7/8	0	0.0
O	DUPLEX PRODUCTS INC	13- 31	23 1/8	- 1/8	-0.5
A	ENNIS BUS. FORMS	5- 21	13 1/2	+ 1/2	+3.8
N	3M COMPANY	43- 60	49 1/4	+ 1/4	+0.5
O	MOORE CORP LTD	26- 34	27 3/4	0	0.0
N	NASHUA CORP	18- 35	27 1/4	+1 1/8	+4.3
C	STANDARD REGISTER	20- 29	23 3/8	+ 3/4	+3.3
A	TAB PRODUCTS CO	8- 19	13 7/8	- 3/8	-2.6
A	WABASH MAGNETICS	10- 22	12 3/4	- 3/8	-2.8
N	WALLACE BUS FORMS	18- 33	26 3/4	- 1/8	-0.4

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